States
ment of
ure

ic
h

Resources and
Technology
Division

Excess Capacity in U.S. Agriculture

An Economic Approach to Measurement

Dan Dvoskin

EXCESS CAPACITY IN U.S. A[illegible] PROACH TO MEASUREMENT. By Dan Dvos[illegible] ogy Division, Economic Research Service, [illegible] ulture. ERS Staff Report No. AGES870618.

ABSTRACT

This report measures excess capacity in U.S. agriculture, which is defined as the difference between potential supply of farm output (actual production plus potential output from acreage reduction programs) and commercial demand (total use adjusted for noncommercial exports) at prevailing prices. The study method enables analysts to assess and estimate excess capacity since 1940. Excess agricultural capacity has been increasing since 1979. The value of excess capacity in 1986 ($12.5 billion) exceeded the previous peak in the sixties, the result of greater agricultural output and a sharp decline in agricultural exports after 1981.

Keywords: excess capacity, measurements, U.S. agriculture

ACKNOWLEDGMENTS

The author would like to acknowledge the contributions of the following people: Luther Tweeten, Department of Agricultural Economics, Oklahoma State University; Pat O'Brien, Commodity Economics Division, Economic Research Service (ERS), U.S. Department of Agriculture (USDA); Milton Erickson, Office of the Administrator, ERS, USDA; Jerry Rector, World Agricultural Outlook Board, USDA; John Miranowski, Kitty Reichelderfer, Neill Schaller, Tony Grano, and Klaus Alt, Resources and Technology Division, ERS, USDA; and Dan Kugler, Office of Grants and Program Systems, USDA. Olga Reynolds, formerly with the Natural Resource Economics Division, ERS, USDA, collected and validated the data. Judith Latham edited the report.

1301 New York Avenue, NW.
Washington, DC 20005-4788

June 1987

CONTENTS

SUMMARY

This study assesses "excess capacity" in U.S. agriculture, a term economists use to denote the difference between potential supply of farm output (actual production plus potential output from acreage reduction programs) and commercial demand (total use adjusted for noncommercial demand) at prevailing prices. It advances an earlier methodology that allows analysts to estimate excess capacity in U.S. agriculture since 1940. The methodology accounts for changes in three annual components: commodity surpluses as the difference between production and total utilization, noncommercial exports, and potential production from acres diverted under Government programs.

Current excess capacity, running at 9 percent with a value of $12.5 billion, far exceeds that during the sixties, which ran at 6 percent with a value of $6 billion. Potential agricultural output is greater now because of higher yields and increased use of agricultural resources.

Expressed as a percentage of potential agricultural production, excess capacity in 1986 was close to 9 percent. However, excess capacity in the major crops (wheat, corn, oats, barley, sorghum, cotton, and soybeans) was two to three times higher than in the agricultural sector as a whole. Longrun excess capacity in the major crops has been increasing since 1979, and it reached 22 percent of potential production in 1986.

Noncommercial exports are the smallest component of excess capacity. Noncommercial export programs have existed since 1955, when P.L. 480 was passed. Until 1979, the value of noncommercial exports ran about $1 billion per year, but recently it has risen to about $2 billion. During the forties, excess supply averaged less than $1 billion (in 1985 dollars). Longrun excess supply was growing rapidly by 1950 and peaked at $7 billion in 1986.

The set-aside programs and noncommercial exports shifted some production potential toward diverted acres and expanded noncommercial exports in the fifties. These policies curtailed excess supply into the sixties, but they had no effect on excess capacity, which continued to increase. The sharp increase in exports in the early seventies reduced excess capacity, but after 1979, excess capacity again increased, peaking in 1986.

Excess Capacity in U.S. Agriculture

An Economic Approach to Measurement

Dan Dvoskin

INTRODUCTION

The objectives of this study are: (1) to clarify the meaning of the term "excess capacity" as it is applied to resource allocation in agriculture, (2) to advance the development of a consistent method of measuring excess capacity in U.S. agriculture, and (3) to use that modified method to evaluate excess capacity from 1940 to 1986, the period during which U.S. agriculture has undergone the most dramatic changes. The period includes the World War II era, when agriculture had little, if any, excess capacity, and later periods of large, widely fluctuating overproduction.

I discuss essential concepts such as capacity, capacity utilization, engineering capacity, and economic capacity. These concepts are the foundations of the theory of excess capacity in agriculture. Because capacity measurements and capacity analysis are widely used in industry, I also assess these concepts as they apply to agricultural and nonagricultural sectors.

Agricultural policies in the past 50 years have been greatly influenced by production increasing faster than domestic and foreign demands. Except in unusual years, the annual output that farmers are willing to produce exceeds the amount demanded at that year's prices. Economists refer to this phenomenon in U.S. agriculture as "excess capacity."

In years when U.S. agriculture's productive capacity resulted in commodity surpluses, the Government intervened to protect farm income through a variety of price-support and acreage reduction programs. This intervention is now at the center of a major policy debate about the future of farm income support programs. Price supports above world market prices stimulate farm output while reducing demand. The supply-curtailing effects of acreage reduction programs are partially offset by increased production through ever-increasing yields on the

----

The author is an agricultural economist with the Resources and Technology Division, Economic Research Service, U.S. Department of Agriculture.

remaining acres. Research and education have given farmers new technology and skills that improved their standard of living by reducing costs and raising yields. Tax and credit policies have encouraged investment in farmland and machinery. Foreign policy has occasionally restricted demand for agricultural products. Awareness of some apparent conflicts and inconsistencies involving policies that both encourage and discourage production has reached a new high as annual farm program costs now run over $25 billion, despite reduced support authorized by the Food Security Act of 1985.

Several policy questions are frequently asked: Should, and can, the Government support farm income at such high prices? What are the costs of supporting farm income at different levels? Do traditional support programs involve conflicts that might be inherently self-defeating? How much reserve capacity does the Nation need to ensure adequate supplies of food and fiber at home and to provide humanitarian food aid in times of famine elsewhere?

To address such issues, policymakers need to know the magnitude of U.S. agriculture's current and potential productive capacity under different policy and market conditions. They need to know how much of that capacity would not be utilized at different demand and commodity price levels.

BACKGROUND

U.S. agricultural production capacity was extensively studied in the seventies when questions arose about the industry's ability to meet future domestic and foreign needs for food (1, 2, 3, 6, 7).[1/] In contrast, sharply reduced demand for U.S. agricultural products, more surpluses, and declining farm prices in the eighties have focused public attention on agriculture's excess capacity.

Economists define "excess capacity" as the difference between potential supply and demand at prevailing product price levels higher than market clearing prices (17). In a perfectly competitive market, the quantities demanded and supplied would be equal at the equilibrium price level and there would be no excess capacity. If the price is supported, potential quantities supplied exceed the quantity demanded. The difference is excess capacity.

Excess capacity has various interpretations in agriculture. Brandow views agricultural excess capacity as a necessary "reserved capacity" for lean years or for the future (1). Others view excess capacity as an indication of Government intervention in agriculture (10, 15, 16, 18). According to Spielmann, "...no satisfactory measure of excess capacity exists nor is there a viable, generally acceptable definition of the term" (13).

1/ Underscored numbers in parentheses refer to items in the references at the end of this report.

Two distinct approaches are important in relating excess capacity to efficient resource allocation: the engineering approach and the economic approach.

Engineering Approach

Capacity for an engineer means the maximum physical production potential of existing fixed plants and equipment as they are operated around the clock; that is, the supply of labor and other variable inputs is unlimited (8). A slightly different interpretation links capacity with a "normal" or "practical" operation schedule by taking into account limited working hours and other physical restraints. The engineering approach emphasizes capital as the fixed and most important production input. It implicitly assumes that capacity is independent of demand and is unrelated to input and output prices and other economic considerations.

The utilization of capacity relates the actual production level of the industry, at a given point, to its physical or technologically given capacity (its maximum physical capacity). This measurement is short run and assumes a given capital stock and an unchanged technology.

Several methods have been proposed and applied to measure capacity utilization. These methods are generally based on some estimates of industry capacity. The exception is the Bureau of Economic Analysis index of capacity utilization (8), which is based on a sample of firms' estimates of their capacity utilization and their desired (or preferred) operating rate.

Spielmann and Weeks suggested a similar method for measuring capacity utilization in agriculture (14). They suggested asking a selected sample of farmers about their actual production and their preferred rate of production. For many reasons, this suggestion was considered neither useful nor feasible.

Economic Approach

The economic approach, unlike the more limited engineering approach, addresses the issue of optimal capacity (minimum-cost capacity or the most profitable capacity). The engineering approach merely indicates the possible production potential for a given set of inputs. This information is similar to the information obtained from examining the maximum point on a shortrun production function or the point at which marginal product equals zero. Operating at such a point is neither efficient nor desirable for the firm or industry.

The economic approach to capacity, in contrast, takes into account relative prices and other conditions for optimal or efficient production. Under normal conditions, economic capacity will be smaller than engineering capacity because firms are likely to operate at a point where their marginal product is greater than zero, but declining.

Capacity Utilization in Agriculture

Except for the survey method proposed by Spielmann and Weeks, analysts generally accept that methods of measuring capacity utilization in industry are neither applicable nor meaningful in agriculture because these methods rely heavily on estimating physical capacity given fixed capital stock. Four factors rule out using measurements of industrial capacity utilization in agriculture:

1. Product substitution in agriculture is far greater than in other industries. Farmers can substitute products without changing fixed factors, which means that many crops can be produced from the same set of land, water, labor, and machinery inputs. Therefore, the aggregation of products is an important issue that can alter the measurement of production capacity.

2. Weather can change the level of agricultural output from one period to another. Thus, physical measurement in one period may be quite misleading.

3. In agriculture, capital is only one of many resources involved in production, which contrasts with industry where capital is the most important resource of production. Because other resources are as important as capital in agriculture, one can justify measuring capacity and capacity utilization with respect to all the possible fixed inputs such as land, water, labor, breeding herd, machinery, and management. These measurements will likely yield different capacity and capacity utilization figures, without revealing which one is the "true capacity."

4. The role of the "fixed" input is another important difference between agricultural and manufacturing industries. In manufacturing industries, changing the size of an existing factory to expand production would require a significant capital investment in new machinery and plant construction; that is, capital stock is fixed in the short run. Most agricultural enterprises have considerable flexibility in increasing production even in the short run with the available fixed resources (such as land and capital). Producers can adopt more intensive cultivation methods and can increase variable inputs, which will likely increase yields. If output prices are attractive enough and if no restrictions are placed on production, farmers can increase production quickly by adopting high-yielding varieties and by increasing the use of fertilizers, water, and other inputs. Such actions can move the whole production function upward quickly.

Excess Capacity

Capacity utilization and excess capacity are sometimes considered the same thing. Although both terms refer to the rate of resource utilization, the difference between these terms is important. It is based on the difference between engineering capacity and economic capacity. Although capacity utilization refers to the relationships between actual production and physical production capacity, excess

capacity refers to the difference between actual production and the <u>optimal</u> or <u>efficient</u> rate of production. Thus, excess capacity relates to "economic full capacity," which is the output level corresponding to the minimum point on the average cost curve (9).

Imperfect Competition and Excess Capacity

Under imperfect competition, the firm faces a downward-sloping demand curve. Relating the demand curve faced by the firm to its cost curve (left side of fig. 1) reveals that in the long run the firm will produce the output (q_1) that is smaller than its minimum cost output (q_2), thereby creating excess capacity (q_1 - q_2). Following Chamberlin (2), Klein (9) shows that only under perfect competition (no Government intervention), when the firm faces a perfectly elastic (horizontal) demand curve, would we expect it to operate with no excess capacity, or where marginal cost (MR) equals minimum average cost (AC) equals market price (P).

Excess Capacity and Resource Allocation

The above example of imperfect competition emphasizes that excess capacity indicates a departure from the optimal or the efficient rate of production. In the microeconomic sense, this situation means a movement backward to the left along the U-shaped cost curve (left side of fig. 1). One can apply the same reasoning to the optimal use of all other resources by the firm. Thus, excess capacity exists if the firm can increase production while reducing its average production costs by changing its resource utilization such that the value of marginal product of each resource will equal that resource's marginal cost.

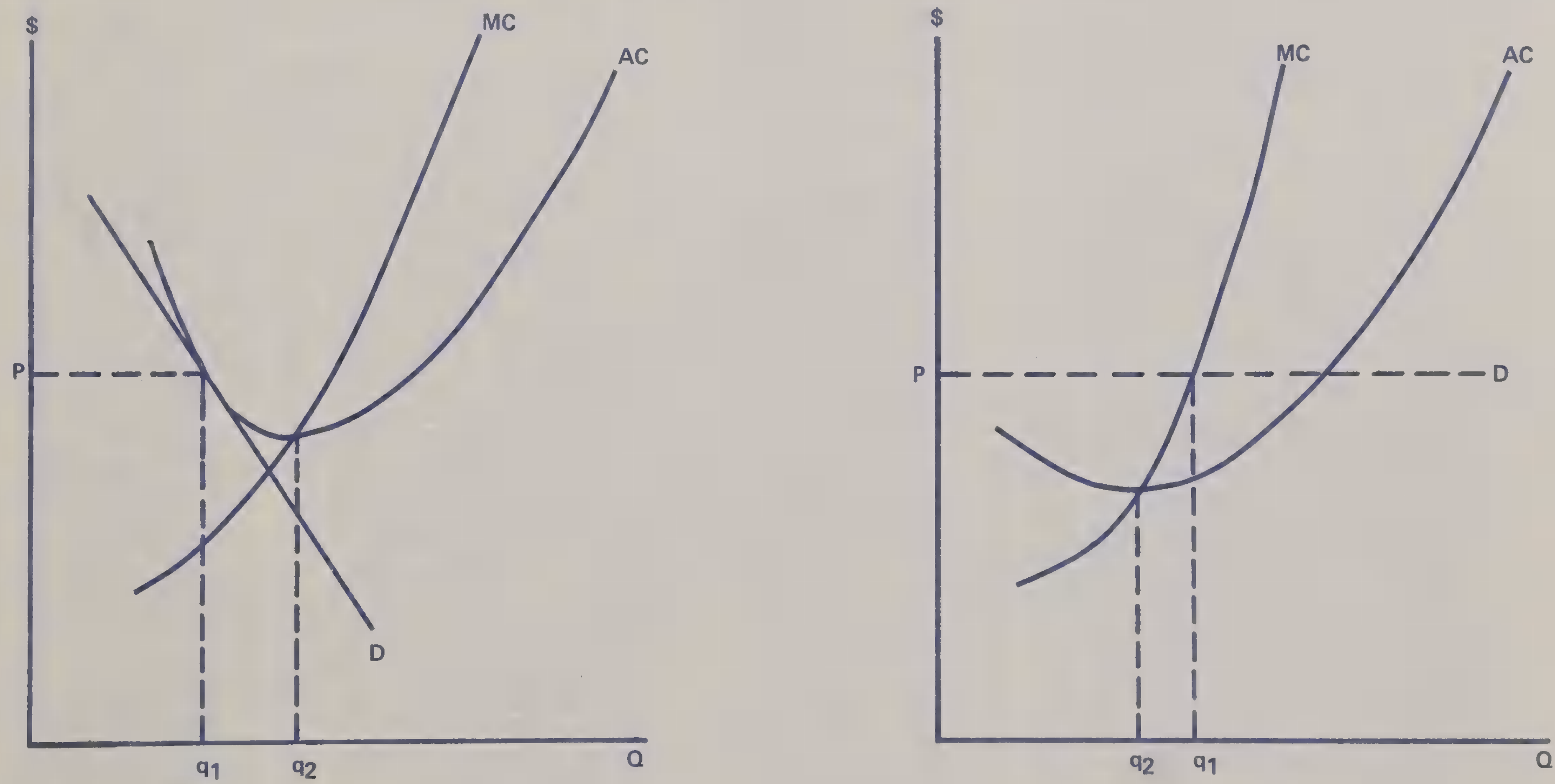
Aggregate Excess Capacity

One can extend the above resource allocation of the firm to a macroeconomic analysis by aggregating over all firms. Thus, excess capacity exists in an industry if aggregate production can be expanded and if such an expansion will reduce production costs. Therefore, "economic full capacity" for an industry is that point on the aggregate production function where the value of the aggregated marginal product equals the aggregated marginal cost of each input. Excess capacity exists if the industry can expand aggregate production and simultaneously lower production costs by reallocating resources among products or among production units.

Excess Supply Capacity and Agriculture

The imperfect competition model may not be fully applicable to a relatively competitive industry like agriculture. In addition, one might consider the presence of commodity surpluses in U.S. agriculture as an indication that the total production level exceeds the economic optimal capacity level (minimum cost level). This situation occurs when support prices are above free-market levels demonstrated for a single agricultural production unit (right side of fig. 1). Thus, in agriculture, we face a situation in which actual production, q_1, exceeds the optimal production level, q_2.

Figure 1: Excess capacity and excess supply capacity



Excess capacity under imperfect competition $(q_2 - q_1)$

Excess supply capacity in U.S. agriculture $(q_1 - q_2)$

Yeh, Tweeten, and Quance (18) have used the term "excess supply capacity" to denote the difference between aggregate demand and supply under price supports above free-market equilibrium prices. The same term can be used to distinguish between q_1 and q_2 for the firm (fig. 1).

In nonagricultural sectors, excess capacity means that firms (or the industry) produce less than optimal capacity; that is, additional capacity, if utilized, would expand production and would reduce production costs. In U.S. agriculture, however, production costs per unit would likely be lower if aggregate production were set at a lower level consistent with commercial demand. Therefore, to be consistent with Klein's definition of excess capacity, we have to characterize the current situation in U.S. agriculture as "excess supply capacity," or excess production reflecting a production level above the optimal level.

Strictly speaking, the current situation in U.S. agriculture should not be characterized as excess capacity, but as excess supply capacity. The use of the term "excess capacity" is probably related to the additional production potential from diverted acres (that is, additional capacity). However, maintaining high support prices and allowing these diverted acres to become productive would lead to even larger surpluses, further shifting the aggregate supply curve to the right and increasing excess supply capacity.

The confusion between excess capacity and excess supply capacity can also be traced to the beginning of the diversion programs in the early fifties. At that time, land diversion was relatively effective, eliminating much of the surplus production. Thus, utilizing diverted acres could have increased production. Although such an increase would have been possible only under support prices that were higher than the equilibrium prices for that period, this additional capacity was often called excess capacity.

From the economic viewpoint, both excess capacity and excess supply capacity represent departures from optimal resource allocation because prices are set above their free market-level either by the firm or by the Government. Because the distinction between the terms is somewhat confusing, economists often use the term "excess capacity" to designate inefficiency in resource allocation caused by either production below the optimum level (as in the case of imperfect competition) or production above the optimum level (as in the case of agriculture).

Government Intervention and Excess Capacity in Agriculture

In a competitive industry such as agriculture, the absence of Government intervention means no excess capacity and no longrun excess production because when some excess capacity develops, prices will start to fall, causing resources to move out of agriculture. The quantity demanded will increase, production will decrease, and excess capacity or excess production will be eliminated. Thus, the equilibrium resource allocation will be at the minimum point on the average cost curve.

Government programs can also alter the resource mix used in production. For example, programs that restrict land use or substitute water development have shifted production away from dryland agriculture toward irrigated agriculture, in effect substituting water for land. A similar substitution takes place when land use is restricted, but the use of other inputs such as fertilizers, chemicals, and capital is not. Thus, eliminating Government intervention could influence supply and demand for agricultural products and the mix of production inputs. However, given a 50-year history of Government programs and market intervention, any practical evaluation of the behavior of the agricultural sector can take place only within the framework of Government price and income-support programs.

Excess capacity is a function of farm prices, influenced by farm policy. However, much of U.S. farm policy itself is directed toward restricting production and using agricultural output to maintain farm income with higher farm prices. These policies are directly related to the size of excess capacity.

Longrun excess capacity in U.S. agriculture is influenced by four major factors: (1) technological changes that increase productivity; (2) changes in foreign and domestic demand for agricultural products; (3) changes in the amount of resources used, especially land and water; and (4) farm policy, especially the specification of commodity prices, tax policy, and interest rates because they influence agricultural investment and resource use.

Working Definition of Excess Capacity

Economic theory, as explained above, links the support of agricultural prices above market clearing to excess capacity. Thus, one could define excess capacity in agriculture as the difference between supply and demand at a given set of prices. This set of prices might be defined as "socially acceptable prices" (17), reflecting public concern for farm income and the well-being of the agricultural sector. Tweeten (15) argues that these "socially acceptable prices" are in reality "politically accepted prices" since they are greatly influenced by the political system.

Such a definition implies that excess capacity is the difference between aggregate supply and aggregate demand of farm output measured at the prevailing farm prices. However, aggregate supply and demand functions for agricultural output are not only unknown but also change over time. Therefore, one must use other methods to estimate excess capacity. Any such method can only be considered as a proxy for the "real" magnitude of excess capacity.

Another definition suggested by Heady and Mayer states that excess capacity is the amount of cropland not needed to fill the demand for agricultural products (7). Both definitions are similar, but may call for a somewhat different computational method.

Earlier Methods and Results

Based on their assumption that actual observed farm prices are "socially or politically acceptable prices," Tweeten and others (10, 12, 17) measured excess capacity using three main sources:

1. The value of all commodities acquired in any given year by the Commodity Credit Corporation (CCC),
2. The value of noncommercial exports (PL-480 and GSM Credit loans[2/]), and
3. The value of production potential from set-aside acres.

The size of excess capacity is expressed as a percentage of total capacity. It is calculated as a ratio of the value of excess capacity to the value of potential agricultural production. This measurement includes the value of actual production plus the value of the excess capacity.

Thus, the calculated excess capacity is only a proxy for the real, but unknown, difference between potential supply and demand, and it represents the difference between what farmers could have produced (at the given price levels) and the value of production that can be cleared by the commercial market (domestic and foreign demand). This procedure implies that all diverted acres will be in production or will be available for production, if no payments are available to growers and if prices remain constant. However, the amount of potential production that might be available from set-aside acres is considerably lower because set-aside acres usually have lower yields and because considerable "slippage" (the difference between register set-aside and the actual reduction in planted acres) exists in the set-aside program (4).

Using this method, Tyner and Tweeten (17) concluded that excess capacity ranged from 5 to 11 percent in 1955-62. Later, Quance and Tweeten (10) concluded that excess capacity ranged between 4 and 8 percent in 1963-69. An unpublished study by Smith and Quance (12) shows excess capacity declined substantially from 1969 to 1977, approaching zero in 1977.

ESTIMATION METHODS

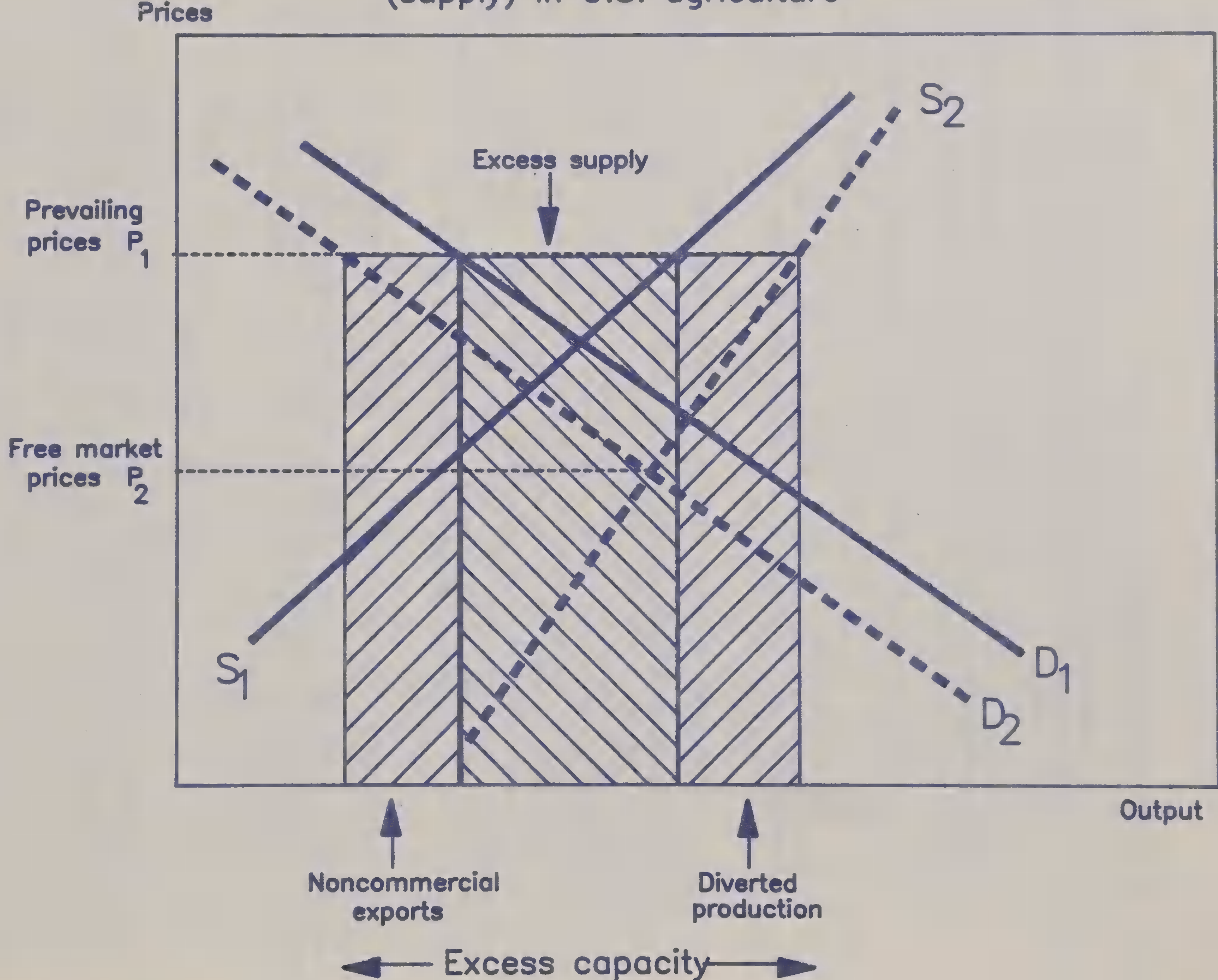
The estimation method used here is similar to that used in previous studies (10, 12, 17) in terms of its use of a proxy measurement composed of three main elements: production potential from set-aside acres, noncommercial exports, and unsold output (or excess supply).

Figure 2 represents a simplified supply and demand analysis for aggregate agricultural output. The supply line, S_1, represents the actual supply function of cropland under cultivation. Line S_2 is the supply curve for all agricultural resources including diverted

----

2/ GSM-Credit is a program where USDA provides low interest loans for purchases of agricultural commodities by importing countries.

Figure 2: Simplified representation of excess capacity (supply) in U.S. agriculture



resources such as set-aside acres. Line D_1 represents hypothetical domestic demand and foreign demand for farm output. However, because export data include noncommercial exports, the commercial demand lies to the left of D_1 and is noted as D_2.

The difference between S_1 and D_1 is excess supply, denoting the amount that is actually produced, but not sold at the prevailing farm prices P_1. The difference between S_2 and S_1 at P_1 is the production potential from set-aside acres. The difference between D_1 and D_2 is the size of noncommercial exports.

Model for Computing Excess Capacity

The model translates the definition shown in figure 2 into a workable computational procedure. This procedure is demonstrated for one commodity, wheat (fig. 3). Table 1 shows 1985 results for all crops. Two issues are significant:

1. Both the computation of the excess capacity of individual crops and their expression as a percentage or as an acreage equivalent are carried out by physical commodity units of the crop (bushels, pounds, and cwt).

2. Commodity prices are used only when aggregate annual figures are calculated. Thus, commodity prices are used to convert different physical units into a common monetary unit that can be added across commodities. For example, the aggregate annual percentage of excess capacity for the seven major crops is calculated in the following equation:

$$E_{p7} = \frac{\sum_{i=1}^{7} P_i E_i}{\sum_{i=1}^{7} P_i Q_i + \sum_{i=1}^{7} P_i S_i} \times 100 \qquad (1)$$

where:

i = crop 1.....7,

E_{p7} = the percentage of the aggregate annual excess capacity for the seven major crops,

P_i = the farm price of crop i,

E_i = the physical quantity of excess capacity of the ith crop,

Q_i = the actual production (physical quantity) of the ith crop, and

S_i = the possible production (physical quantity) of the ith crop from its set-aside acres.

Table 1--Excess capacity of U.S. agriculture: Actual data analysis, 1985

Crop	Harvested acres	Yields	Actual production	Imports	Domestic use	Total exports	Excess supply	Noncommercial exports		Effective set-aside	Set-aside production[1]	Excess capacity		Average farm prices	Value excess capacity	Proportion of crop production	Acreage equivalent
								PL-480	GSM-Credit			Amount	Proportion				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)[2]	(8)	(9)	(10)	(11)[3]	(12)[4]	(13)[5]	(14)	(15)[6]	(16)[7]	(17)[8]
	1,000 acres	Unit per acre	Million units							1,000 acres	Million units		Pecrcent	Dollar per unit	Million dollars	Percent	1,000 acres
Group 1:																	
Wheat	64,734	37.5	2,425	15	1,045	915	480	116	178	14,100	423	1,196	42.0	3.19	3,816	21.0	34,759
Corn	75,224	118.0	8,876	11	5,255	1,241	2,391	23	70	3,304	312	2,796	30.4	2.49	6,961	38.4	24,356
Oats	8,177	63.7	521	28	543	2	4	0	0	66	3	7	1.4	1.42	10	.1	128
Barley	11,603	51.0	592	9	500	22	79	0	10	462	19	107	17.6	2.09	225	1.2	2,199
Sorghum	16,782	66.8	1,121	0	691	178	252	22	18	522	28	320	27.8	3.99	1,276	7.0	4,892
Cotton	10,229	630.0	13	0	6	2	5	0	0	2,268	2	8	49.8	.55	2,079	11.5	6,453
Soybeans	61,584	34.1	2,099	0	1,139	740	220	56	40	0	0	316	15.1	5.41	1,709	9.4	9,272
Total crops	248,333									20,722			29.7		16,077	88.7	82,059
Total value[9]			51,182	134	28,843	11,299	11,173	827	1,168		2,908	16,077					
Group 2:																	
Rye	717	28.8	21	2	24	0	-1	0	0	0	0	-1	-6.6	2.49	-3	0	-47
Rice	2,492	5,414.0	135	2	66	59	12	4	5	912	40	61	34.9	7.85	478	2.6	1,307
Tobacco	688	2,197.0	1,512	0	857	586	69			0	0	69	4.6	1.70	118	.6	31
Peanut	1,467	2,810.0	4,123	2	3,661	1,043	-579			0	0	-579	-14.0	.24	-141	-.8	-206
Dairy			143,113	2,776	130,600	2,700	12,589					12,589	8.8	.13	1,603	8.8	
Grand total	253,697									21,634			12.5[10]		18,130	100.0	83,143
Total value[9]			74,090	508	48,396	13,357	12,846	860	1,205		3,219	18,130					

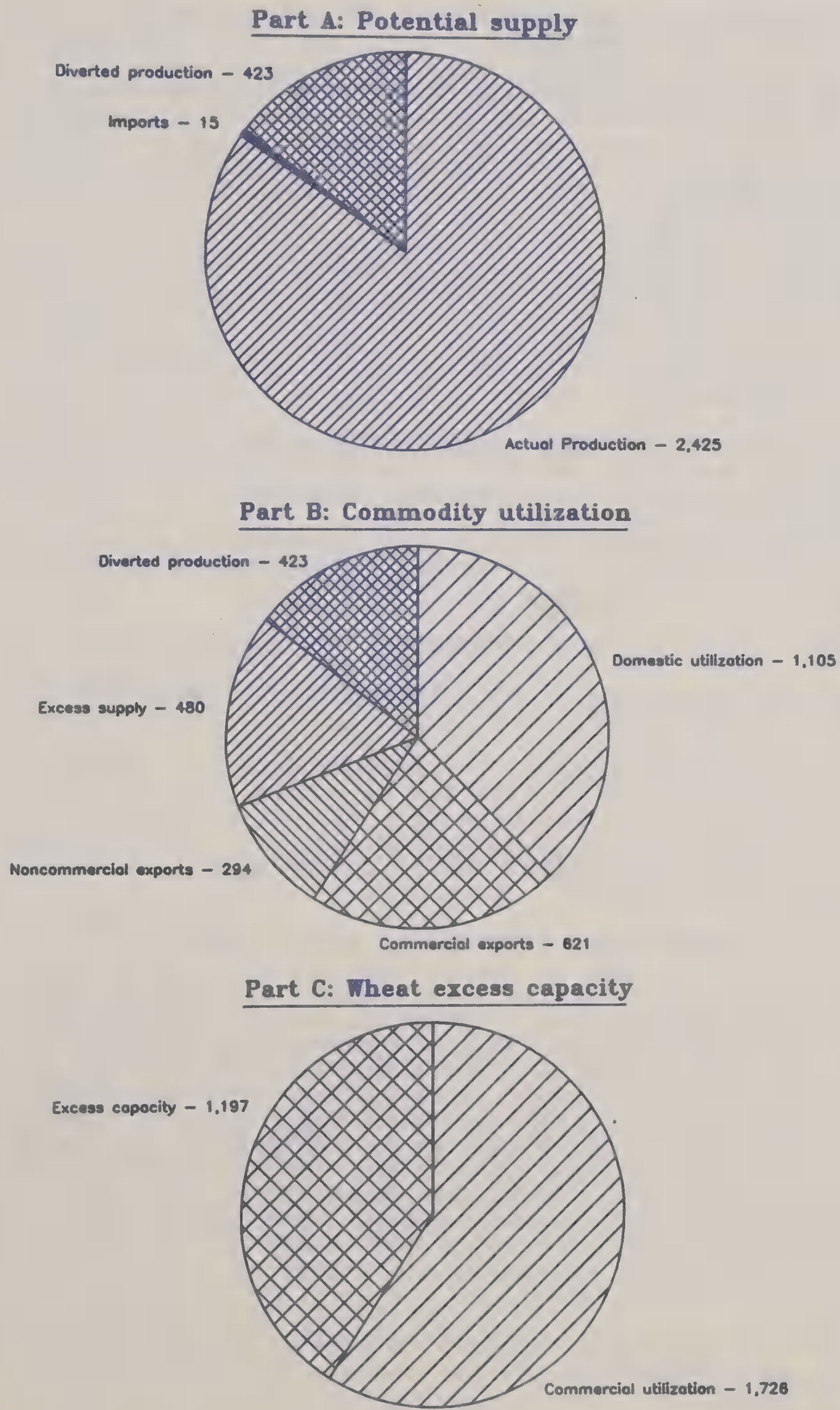
Blanks indicate not applicable.

Notes:

1 Yield adjustment factor on set-aside land -- 0.8.
2 Col. 7 = (col. 3 + col. 4) - (col. 5 + col. 6).
3 Col. 11 = (col. 10) * (col. 2) * yield adjustment factor.
4 Col. 12 = (col. 7) + (col. 8) + (col. 9) + (col. 11).
5 Col. 13 = (col. 12) over ((col. 3) + (col. 11)).
6 Col. 15 = (col. 12) * (col. 14).
7 Col. 16 = (col. 15) over total of (col. 15).
8 Col. 17 = ((col. 12) - (col. 11)) over (col. 2) + (col. 10).
9 Total values in million dollars.
10 Total value of farm products $142.1 billion.

Crop	Yield units	Production units
Wheat	Bushel	Bushel
Corn	Bushel	Bushel
Oats	Bushel	Bushel
Barley	Bushel	Bushel
Sorghum	Bushel	Bushel
Cotton	Pound	Bale
Soybeans	Bushel	Bushel
Rye	Bushel	Bushel
Rice	Pound	100 pounds
Tobacco	Pound	Pound
Peanuts	Pound	Pound
Dairy		Pound

Figure 3: Excess capacity for wheat, 1985
(million bushels)



This study employs the following terms to compute the various components of excess capacity:

- Crop production: annual production as derived from multiplying crop acres by crop yield;
- Excess supply: annual difference between production plus imports for each commodity minus actual domestic and total export utilization for that year;
- Domestic utilization: annual domestic removal of commodity from the market for food, feed, seed, or any other domestic use;
- Commercial exports: total export of each commodity minus noncommercial exports;
- Noncommercial exports: annual additional exported quantities of each commodity as part of PL-480 or GSM-credit programs (see also section on noncommercial exports);
- Noncommercial adjustment factor: proportion of exports under PL-480 and GSM credit programs considered to be noncommercial exports;
- Total exports: sum of commercial and noncommercial exports;
- Diverted production: potential physical production from set-aside acres;
- Excess capacity: sum of diverted production, excess supply, and noncommercial exports for each commodity (see fig. 2 and 3); and
- Commercial utilization: sum of domestic utilization and commercial exports.

Commodities Affected by Excess Capacity

There may be seasonal or short-term surpluses in the production of many agricultural commodities. However, only a limited number of commodities have both significant and measurable longrun excess capacity. Because no public funds are available to cover storage costs of such products, short-term surpluses of fresh fruits and vegetables are normally a small part of the overall production. Prices of fresh fruit and vegetables are determined in the market place. Short-term surpluses generally lower commodity prices and eliminate surpluses.[3/] This situation occurs because supply contracts and quantity demanded increase when prices fall. However, commodities that are both storable and covered by some kind of price-support or paid diversion program are likely to have significant as

----

3/ Marketing order programs are in effect for some crops. These programs restrict the sale, but prices are normally determined by supply and demand.

well as measurable surpluses. Such commodities, the main focus of this study, include wheat, corn, oats, barley, sorghum, cotton, and soybeans. Other crops such as rye, rice, tobacco, peanuts, and dairy products have sometimes come under Government programs and registered surpluses. Although these other crops are included in the study, the analysis emphasizes excess capacity for the seven major crops. This choice follows the policymakers who emphasize this group of crops in setting agricultural policies.

Production Potential of Diverted Acres

The main objective of set-aside and other diversion programs is to decrease production and thereby reduce excess supply. Therefore, measuring excess capacity requires one to estimate the potential production of these diverted acres and add it to actual production. Estimating the production potential of the diverted acres is a complex matter made more difficult by the lack of consensus on the effectiveness of these diversion programs. As pointed out by other researchers (5), none of the acreage diversion programs is 100-percent effective. The overall effectiveness of the programs may be as low as 50 percent (16). Thus, on the average, 2 acres may need to be taken out of production to eliminate the production of 1 acre. Ericksen and Collins (5) give the following reasons for the ineffectiveness of the acreage diversion programs:

1. Farmers tend to put their lowest yielding acres into the diversion programs.
2. Yields on the remaining acres tend to increase as farmers apply more inputs in anticipation of higher prices.
3. Every program involves a "slippage" factor, which means that harvested acres change less than the change in idled acres (4).

Ericksen and Collins have shown that slippage may vary by crop, region, and year (5). It is also influenced by the exact specification of the control program.

Acreage Slippage

The current estimation of the effectiveness of diversion programs is related to the method described earlier (4, 5). The method relates changes in harvested acres since the beginning of the set-aside programs in 1956 to changes in program acres idled. This procedure employed regression analysis in which the annual difference in harvested acres is a function of the difference in set-aside acres (see app. table). Thus, a regression coefficient of 1 means no slippage; that is, the program is fully effective. However, a regression coefficient of 0.5 means the program is only 50-percent effective. Some regression coefficients were not statistically significant. For these crops, the average effectiveness coefficient (0.66) was used.

Yields on Diverted Acres

Exact yields on diverted acres are unknown because by definition, these acres are not in production. However, other studies have suggested that the yields of diverted acres are approximately 80 percent of the average crop yield (15, 16, 19).

Noncommercial Exports

Various Government export credit and food donation programs have been long used to dispose of some commodity surpluses. In the recipient countries, these programs also provide humanitarian assistance, social stability, and political cooperation. Noncommercial exports present a problem when one measures excess capacity. As in diverted production (potential production from set-aside acres), one cannot determine the amount and values of these exported commodities if noncommercial exports programs had not been available. At one extreme, one could suggest that all noncommercial exports are part of the surplus and should be added to excess capacity. Or, one could claim that, if no Government export programs were available, importing countries would turn to commercial purchases in equal amounts. Under the latter assumption, noncommercial exports would not be included in excess capacity.

Elimination of noncommercial exports would probably increase commercial purchases by importing countries somewhat. But the increase in commercial purchases of the commodity involved would not be so large as the reduction in the noncommercial exports. Thus, total exports of the commodity involved would decline. For example, Tyner and Tweeten (17) assumed that eliminating noncommercial export-enhancement programs, such as GSM-Credit and PL-480, would decrease the total exports of the commodities involved by an amount equal to 40 percent of total exports under these enhancement programs. The estimated proportion of noncommercial exports for each program varies and is a function of both overall export levels and the number of recipient countries. These estimates were derived from unpublished studies of the Economic Research Service (11).

Excess Supply

Other studies (10, 12, 15, 17) have accounted for unsold output by examining CCC purchases or net changes in the holdings of CCC stocks. These studies have also examined changes in other stocks held by farmers. However, this method tends to inflate the value of excess capacity, because the CCC sometimes purchases not only raw products (such as grain) but also processed products (such as butter, cheese, and other processed dairy products). CCC outlays are, therefore, greater than the actual value of the raw products evaluated at farm-level prices. For example, CCC net expenditures on purchasing dairy products amounted to about $2.1 billion in 1980; however, the value of the excess milk supply evaluated at the average farm milk price was only $1.2 billion. Because we are dealing with excess capacity at the production level, costs of processing, transportation, and handling are not part of agricultural excess capacity.

To summarize, excess supply (surpluses) is estimated by the quantities of each commodity not sold in any given year. The physical quantities of each commodity used (domestic consumption and exports) are subtracted from the quantities produced in any given year.

Moving-Average Results

This computation procedure results in annual changes in actual and potential commodity balances. Actual changes are variations in commodity stocks whereas potential changes reflect changes that would have taken place if diverted acres had been producing. Thus, if potential production from diverted acres is added to actual production and if noncommercial exports are subtracted from total commodity utilization, excess capacity is represented by the longrun changes in potential commodity stocks.

The simplest procedure for transforming the annual potential commodity balances to excess capacity is to use a statistical moving-average process.[4/] Such a procedure is needed because, when there are potential commodity surpluses (that is, potential production[5/] is greater than utilization), commodity stocks will increase, whereas potential commodity shortfalls (that is, potential production is smaller than utilization) will cause commodity stocks to decline.

The changes in the commodity stocks are simulated by the moving-average process which "smoothes" out the year to year variations and provides for a more stable trend of the estimated excess capacity values.

STUDY RESULTS

A limited number of crops have longrun excess capacity. These crops were traditionally given the most policy attention and public funding. Income support achieved by setting farm prices above their free market equilibrium levels determined by supply and demand will likely require additional programs to divert production and to reduce excess supply.

Dividing the reported crops into two groups is the most convenient way to present results. The first group includes the seven major crops--wheat, feed grains (oats, barley, corn, sorghum), cotton, and soybeans--which account for most of the excess capacity. The second group includes rye, rice, peanuts, tobacco, and dairy. The crops in the second group are more localized and are concentrated in a limited number of States such as California (rice) and the East (peanuts and tobacco).

4/ A moving average is a statistical process in which the new time series is generated by some average of values in the initial time series.

5/ Potential production includes actual annual production and potential production from set-aside acres.

Magnitude of Excess Capacity 1940-86

A major goal of this study is to estimate the magnitude of excess capacity over time (1940-86). Table 2 shows the magnitude of excess capacity measured in current prices, constant 1985 dollars, percentage of all crops, percentage of major crops, and acreage equivalents. Figure 4 shows the aggregated value of excess capacity. These values, measured in constant 1985 dollars (using the general gross national product (GNP) deflator), are also shown as 3-year and 7-year moving-average curves.

Percentage of Excess Capacity

Figures 5 and 6 express commodity balances and show the excess capacity of U.S. agriculture as a percentage of output[6/] for U.S. agriculture and for the seven major crops. Excess capacity is a far more serious problem for the seven major crops. During the fifties, sixties, and eighties, the percentage of excess capacity in the major crop group is about two to three times higher than for agriculture as a whole. The longrun excess capacity of the seven major crops has continuously increased since 1979 and has been above 20 percent since 1985. Longrun excess capacity for the whole agricultural sector, however, was only 8-9 percent in the 1985-86 period.

Current percentage and value of excess capacity is the highest on record. This situation has occurred because current high yields and increased use of agricultural inputs make potential agricultural output much greater today than in any time in the past.

Figures 5 and 6 show that excess capacity was not a serious problem until 1950. During the forties, longrun excess capacity was about 1 percent. The sharp increase in crop yields and planted acres after World War II led to a rapid growth in surpluses (excess supply). The introduction of diversion programs during the fifties reduced surpluses, but did not solve the problem of increased excess capacity.

Acreage Equivalents

One way to express excess capacity is to show it as an acreage equivalent. This technique is useful because land is the most common physical resource and one can use acreage equivalent in adding together the excess capacity of different crops. Note, however, that cropland is not the only resource in excess capacity and that land diversion is not the only way to deal with the problem. The derived acreage equivalent (fig. 7) does not represent the actual number of acres that must be taken out of production to eliminate excess capacity. The number of acres that need to be taken out of production will, in fact, be much greater for the following reasons:

1. Excess capacity in the dairy sector can not be converted to an acreage equivalent.

6/ See equation 1 on page 11.

Table 2--Excess capacity in U.S. agriculture, 1940-86

Year	Current values	Fixed values: Farm product price index	Fixed values: GNP deflator index	All crops	Major crops	Acreage equivalent	
	Million dollars	Million 1985 dollars		Percent		Million acres	Percent of harvested acres
1940	233.6	1,371.4	2,007.3	2.79	0	12.537	3.70
1941	43.8	207.4	354.6	.39	1.22	9.684	2.83
1942	66.5	245.5	505.2	.43	.15	2.326	0.67
1943	-324.9	-988.2	-2,403.6	-1.66	-7.11	-22.699	-6.38
1944	504.9	1,504.5	3,686.3	2.46	5.18	11.144	3.09
1945	-384.8	-1,091.2	-2,737.7	-1.78	-8.12	-14.989	-4.23
1946	-107.1	-266.4	-616.6	-0.43	-4.27	-3.349	-0.95
1947	208.6	443.7	1,054.5	.70	0	0.780	0.22
1948	1,827.7	3,738.2	8,650.6	6.05	14.42	33.674	9.46
1949	645.8	1,516.4	3,069.7	2.32	4.76	11.438	3.18
1950	-901.6	-2,051.3	-4,213.7	-3.17	-8.93	-9.623	-2.79
1951	-637.7	-1,239.4	-2,837.8	-1.94	-6.14	-18.958	-5.51
1952	1,753.0	3,573.0	7,678.9	5.39	13.15	30.363	8.68
1953	2,068.9	4,762.5	8,922.6	6.67	13.41	30.701	8.93
1954	1,501.8	3,583.5	6,378.2	5.03	8.11	20.874	6.12
1955	1,175.4	2,973.8	4,826.7	3.99	7.77	11.506	3.44
1956	1,078.1	2,751.4	4,285.4	3.50	6.84	17.611	5.52
1957	1,735.4	4,334.8	6,661.3	5.69	14.97	43.414	13.63
1958	2,901.5	6,812.7	10,912.3	8.43	21.92	53.554	16.81
1959	1,397.5	3,418.0	5,134.8	4.10	11.99	33.982	10.65
1960	1,796.9	4,413.4	6,495.7	5.15	14.49	42.481	13.33
1961	2,119.8	5,184.7	7,589.2	5.79	13.50	37.799	12.72
1962	2,905.9	6,990.9	10,175.2	7.61	16.72	45.991	15.93
1963	2,277.8	5,502.2	7,852.6	5.83	14.46	38.985	13.33
1964	2,428.0	6,013.7	8,243.4	6.24	14.81	39.728	13.55
1965	2,370.5	5,610.8	7,833.9	5.76	15.07	38.116	12.97
1966	2,117.7	4,673.3	6,758.5	4.63	14.58	41.312	14.22
1967	2,745.0	6,343.9	8,541.0	6.19	16.78	46.165	15.22
1968	3,375.9	7,592.5	10,002.3	7.33	22.31	59.199	19.86
1969	2,689.1	5,740.0	7,547.0	5.34	16.58	47.196	16.29

See note at end of table.

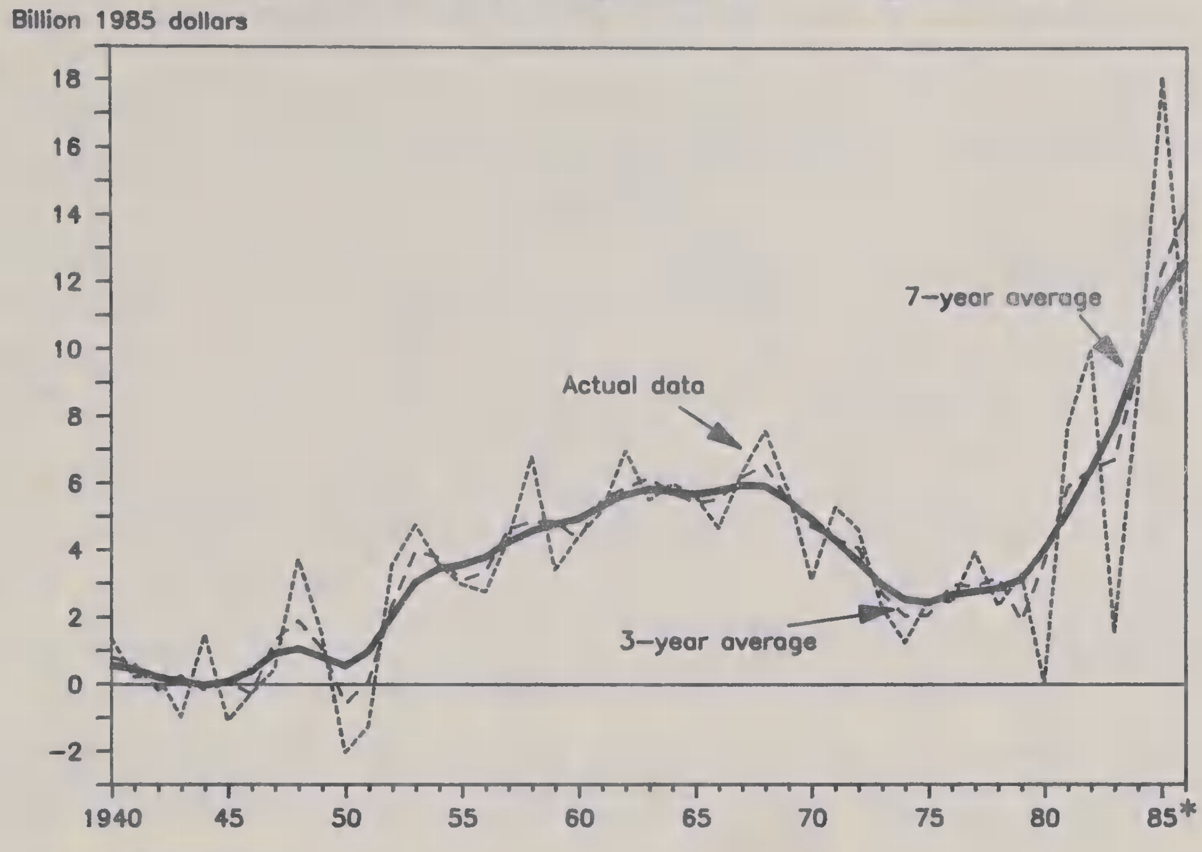
Continued--

Table 2--Excess capacity in U.S. agriculture, 1940-86--Continued

Year	Current values	Fixed values: Farm product price index	Fixed values: GNP deflator index	All crops	Major crops	Acreage equivalent	
	Million dollars	Million 1985 dollars		Percent		Million acres	Percent of harvested acres
1970	1,449.8	3,106.0	3,855.9	2.76	6.34	23.398	7.99
1971	2,538.6	5,303.1	6,386.6	4.29	13.30	39.104	12.82
1972	2,469.0	4,630.4	5,930.9	3.84	9.31	26.355	8.96
1973	1,731.7	2,274.0	3,907.6	1.95	4.40	9.891	3.08
1974	1,016.3	1,240.2	2,102.2	1.10	1.80	4.455	1.36
1975	2,019.0	2,559.7	3,803.0	2.26	3.52	13.189	3.93
1976	1,932.4	2,444.7	3,420.8	2.02	4.49	18.324	5.44
1977	3,080.5	3,956.8	5,112.8	3.20	7.17	19.420	5.63
1978	2,091.4	2,342.8	3,235.5	1.83	3.71	11.740	3.47
1979	3,389.1	3,304.7	4,816.3	2.55	6.90	20.326	5.84
1980	-8.0	-7.7	-10.4	-.01	-2.40	-2.939	-0.83
1981	8,368.8	7,760.6	9,944.6	5.87	10.93	27.490	7.51
1982	10,400.1	10,024.4	11,616.9	7.12	14.05	42.238	11.67
1983	1,597.4	1,527.2	1,719.0	1.08	-1.66	17.455	5.70
1984	9,612.2	8,680.5	9,932.3	6.69	14.59	46.197	13.80
1985	18,130.3	18,130.3	18,130.3	12.48	29.72	83.143	25.19
1986	9,835.9	10,235.1	9,605.4	7.10	20.38	60.012	19.20
Average		3,854.9	5,231.2	3.72	8.41	24.484	7.77

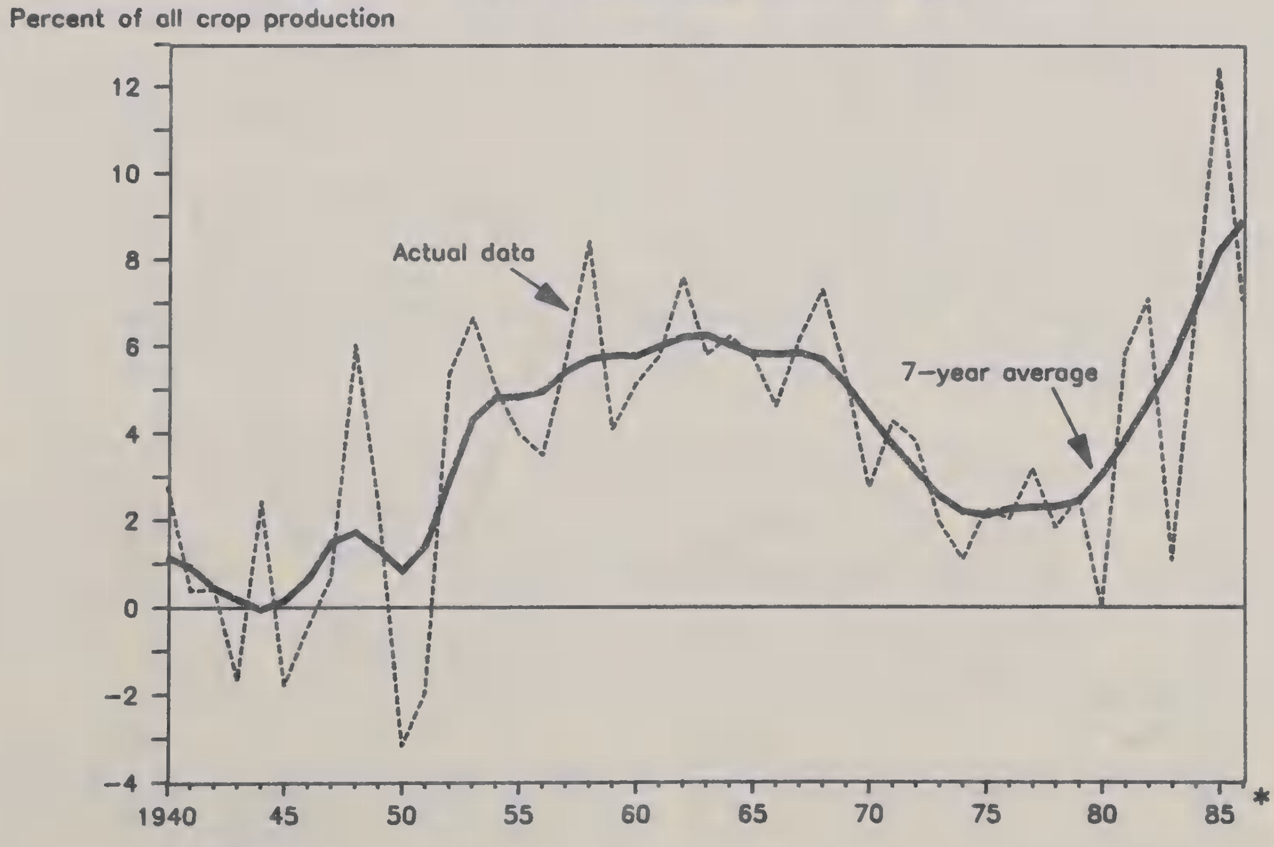
Blanks indicate not applicable.

Figure 4: Excess capacity in U.S. agriculture



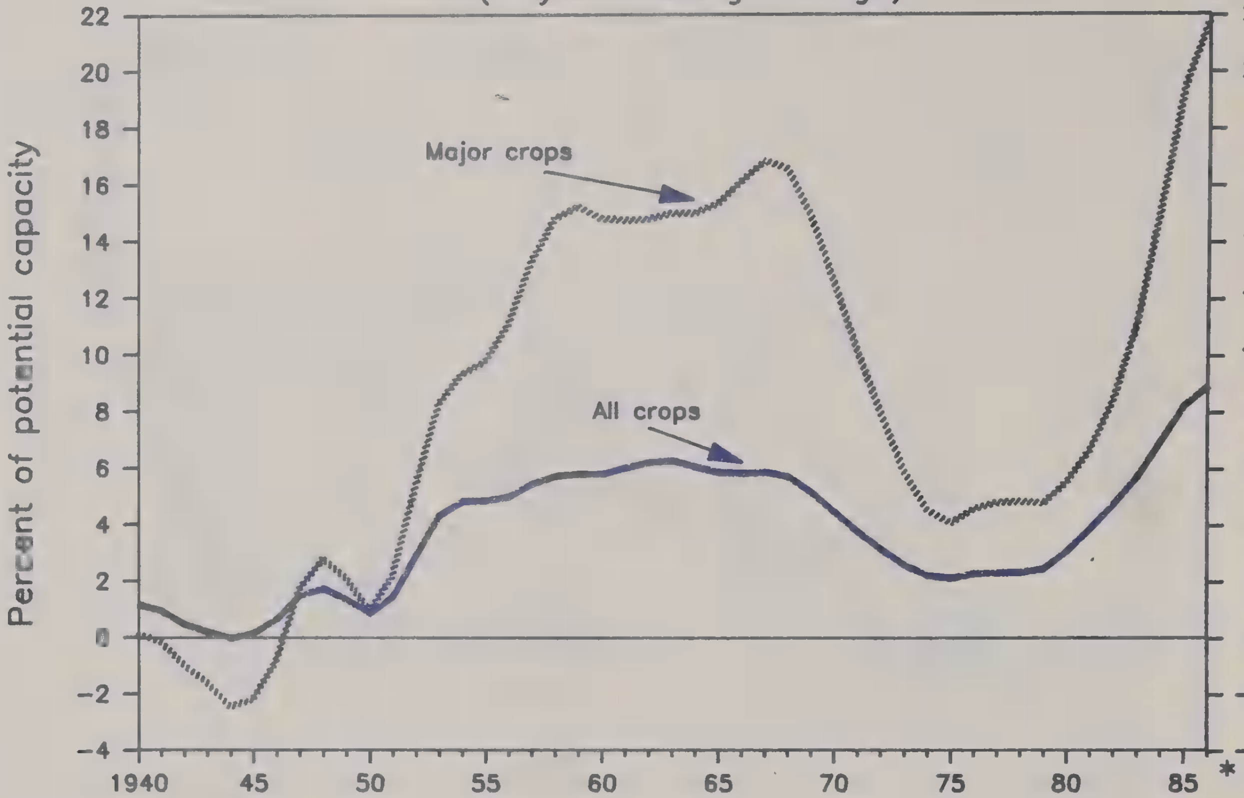
* Preliminary

Figure 5: Excess capacity in U.S. agriculture



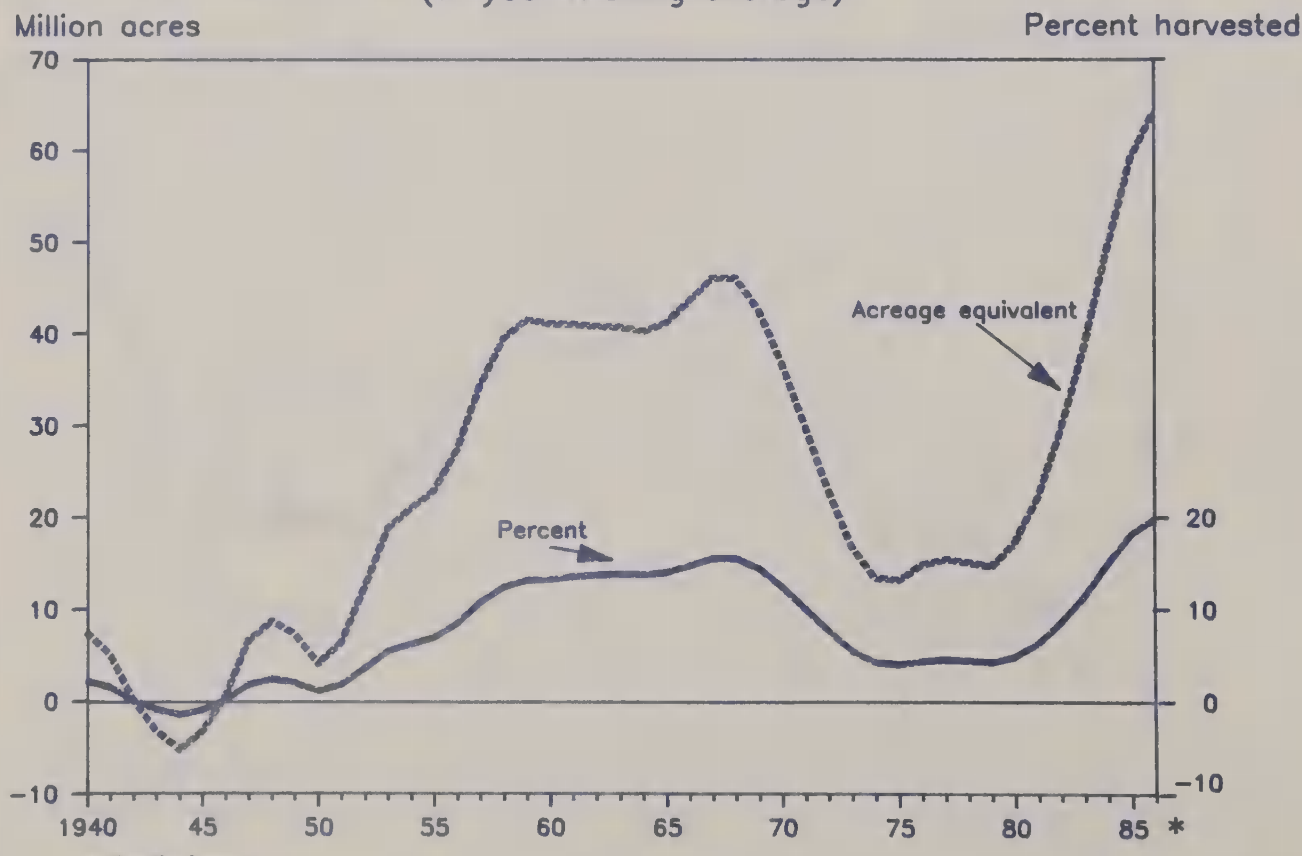
* Preliminary

Figure 6: Longrun excess capacity
(7-year moving average)



* Preliminary

Figure 7: Longrun excess capacity, acreage equivalent
(7-year moving average)



* Preliminary

2. The set-aside program is only about two-thirds effective, which means it generally takes the removal of 3 acres from production to eliminate the actual production of 2 acres.

3. The acres eventually taken out of production are likely to be less productive. Therefore, the actual reduction in quantities will be much smaller than the reduction in acreage.

4. Participating farmers are likely to increase their production on the remaining acres by increasing the use of inputs other than land.

5. Nonparticipating farmers are likely to increase the use of all inputs (including land) in anticipation of higher commodity prices.

Thus, the actual number of acres needed to be taken out of production to balance production with commercial demand may be 50-100 percent greater than the acreage equivalent presented in figure 7.

One can compute acreage equivalent by calculating the number of acres required to produce the physical quantity of excess capacity for each crop while assuming average yield and no change in other resource use.

Composition of Excess Capacity

Measuring excess capacity, as indicated, is composed of three parts: excess supply, noncommercial exports, and diverted production. Table 3 shows the distribution of excess capacity, measured in 1985 dollars, among these three components. The results clearly show that noncommercial exports are the smallest component of excess capacity (fig. 8). The noncommercial export programs began in 1955 with the passage of PL-480. Until the end of the seventies, noncommercial exports have averaged about $1 billion annually and have changed little. Since the beginning of the eighties, noncommercial exports have increased to around $2 billion per year (1985 prices). Excess supply during the forties averaged less than one $1 billion (1985 dollars), but longrun excess supply had grown rapidly by 1950.

The set-aside programs and noncommercial exports were linked to the rise in excess supply. Some production potential shifted to diverted acres and to expanded exports. This policy seemed to work fairly well during the fifties and the sixties, when excess supply declined (fig. 8). In the late fifties and sixties, excess supply declined and diverted production increased. By the end of the sixties and the beginning of the seventies, there was even a negative longrun excess supply. However, by 1974, excess supply became positive.

Excess supply and diverted production were about $1 billion at the beginning of the seventies. The sharp decline in exports in the eighties has changed the situation. Beginning in 1982 both excess supply and diverted production have risen.

Table 3--Sources of excess capacity, 1940-86

Year	Excess supply		Noncommercial exports		Diverted acres		Total excess capacity	
	Major crops	All crops	Major crops	All crops	Major crops	All crops	Major crops	All crops
	Million 1985 dollars							
1940	967.8	1,371.4					967.8	1371.4
1941	269.6	207.4					269.6	207.4
1942	34.1	245.5					34.1	245.5
1943	-1,551.2	-988.2					-1,551.2	-988.2
1944	1,162.6	1,504.5					1,162.6	1,504.5
1945	-1,825.7	-1,091.2					-1,825.7	-1,091.2
1946	-1,134.7	-266.4					-1,134.7	-266.4
1947	-1.2	443.7					-1.2	443.7
1948	3,378.9	3,738.2					3,378.9	3,738.2
1949	1,118.6	1,516.4					1,118.6	1,516.4
1950	-2,246.8	-2,051.3					-2,246.8	-2,051.3
1951	-1,439.8	-1,239.4					-1,439.8	-1,239.4
1952	3,344.2	3,573.0					3,344.2	3,573.0
1953	3,618.2	4,762.5					3,618.2	4,762.5
1954	2,171.4	3,583.5					2,171.4	3,583.5
1955	1,911.0	2,755.6	216.5	218.3			2,127.5	2,973.8
1956	292.6	1,000.4	679.9	713.0	984.6	1,038.0	1,957.1	2,751.4
1957	933.4	1,078.6	1,200.8	1,317.7	1,843.1	1,938.5	3,977.3	4,334.8
1958	3,532.8	3,761.2	719.9	748.0	2,159.5	2,303.5	6,412.2	6,812.7
1959	1,339.6	1,418.7	883.2	919.2	1,058.3	1,080.0	3,281.1	3,418.0
1960	1,704.6	1,873.7	976.2	1,032.7	1,476.6	1,506.9	4,157.4	4,413.4
1961	-500.8	290.2	1,247.4	1,322.1	3,541.3	3,572.5	4,288.0	5,184.7
1962	-162.5	1,378.0	1,425.4	1,471.1	4,111.5	4,141.8	5,374.5	6,990.9
1963	-311.5	265.1	1,298.0	1,363.6	3,844.4	3,873.5	4,830.9	5,502.2
1964	-28.0	1,020.4	1,067.4	1,139.6	3,832.1	3,853.6	4,871.4	6,013.7
1965	-197.7	189.2	1,100.2	1,158.6	4,244.9	4,263.1	5,147.4	5,610.8
1966	-1,206.4	-1,467.7	1,091.1	1,126.8	4,902.4	5,014.2	4,787.1	4,673.3
1967	1,013.8	1,766.7	952.8	1,039.2	3,454.9	3,537.9	5,421.5	6,343.9
1968	2,165.4	2,490.1	840.1	912.9	4,110.3	4,189.5	7,115.8	7,592.5
1969	96.8	427.2	561.9	660.5	4,583.0	4,652.2	5,241.7	5,740.0

See note at end of table.

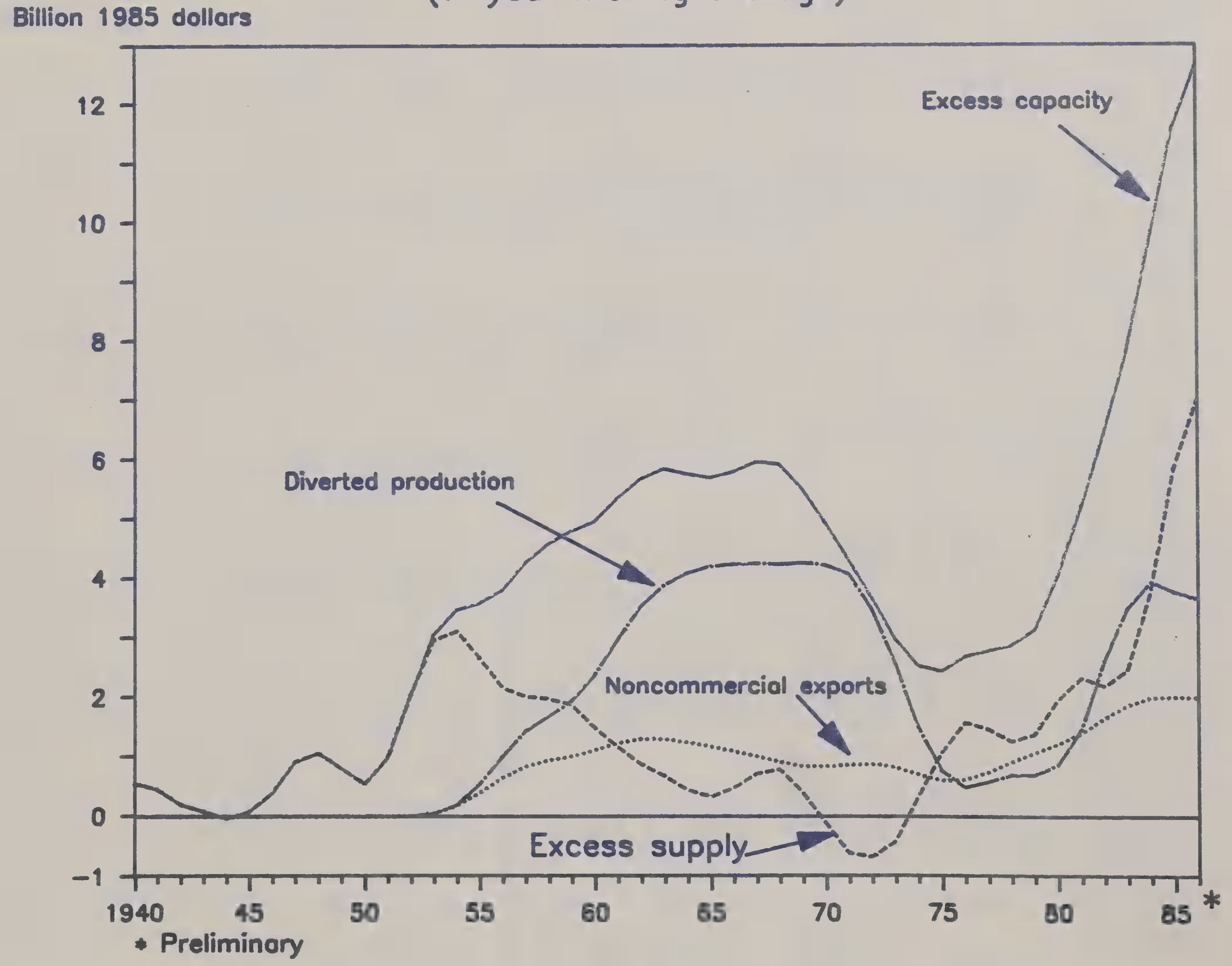
Continued--

Table 3--Sources of excess capacity, 1940-86--Continued

Year	Excess supply		Noncommercial exports		Diverted acres		Total excess capacity	
	Major crops	All crops	Major crops	All crops	Major crops	All crops	Major crops	All crops
	Million 1985 dollars							
1970	-3,006.0	-2,170.9	699.1	796.7	4,407.1	4,480.3	2,100.2	3,106.0
1971	947.5	1,502.4	714.3	813.8	2,932.9	2,986.9	4,594.7	5,303.1
1972	-2,704.5	-2,460.2	825.9	949.0	6,099.7	6,141.6	4,221.1	4,630.4
1973	-1,125.4	-1,250.0	1,103.1	1,268.3	2,223.0	2,255.7	2,200.7	2,274.0
1974	127.8	472.3	347.5	421.2	309.8	346.7	785.1	1,240.2
1975	960.2	1,806.3	314.0	386.0	327.5	367.4	1,601.7	2,559.7
1976	1,311.6	1,740.4	472.6	516.4	187.9	187.9	1,972.0	2,444.7
1977	2,539.5	3,181.3	598.5	692.3	83.2	83.2	3,221.2	3,956.8
1978	-779.7	-219.0	976.7	1,033.1	1,528.7	1,528.7	1,725.6	2,342.8
1979	1,291.1	1,085.5	1,037.5	1,096.1	1,123.1	1,123.1	3,451.7	3,304.7
1980	-2,314.7	-1,243.[illegible]	1,140.5	1,236.1			-1,174.1	-7.7
1981	3,994.1	6,519.7	1,152.6	1,240.9			5,146.7	7,760.6
1982	4,916.6	7,628.0	1,188.2	1,234.5	1,072.3	1,161.9	7,177.1	10,024.4
1983	11,397.0	-9,584.6	2,610.5	2,700.2	7,999.3	8,411.5	-787.1	1,527.2
1984	2,599.7	4,430.8	1,731.6	1,821.0	2,253.8	2,428.8	6,585.1	8,680.5
1985	11,173.2	12,846.2	1,995.2	2,065.5	2,908.5	3,218.6	16,077.0	18,130.3
1986	3,345.0	4,296.8	1,856.2	1,896.6	3,795.5	4,041.7	8,996.7	10,235.1
Average	645.3	1,322.1	702.7	751.3	1,731.9	1,781.5	3,079.8	3,854.9

Blanks indicate not applicable (no programs).

Figure 8: Excess capacity composition
(7–year moving average)



One should not overemphasize the role of diversion programs and noncommercial exports in controlling excess supply in the sixties. Although excess supply decreased between 1954 and 1972 in response to these programs, longrun excess capacity actually increased, reaching its peak in the early sixties (fig. 8). Almost all the excess capacity at that time came from diverted production, which peaked in the 1965-70 period.

Impacts of Domestic and Foreign Demand

Excess capacity results from the interaction of supply and demand. Table 4 shows the value of domestic utilization, exports, total utilization, and the resulting excess capacity measured in constant 1985 dollars. Figure 9 shows the 7-year moving averages of commercial exports and excess capacity. During the fifties and the sixties, commercial exports increased moderately. Production capabilities increased more rapidly, resulting in an almost constant increase in longrun excess capacity.

Longrun excess capacity dropped significantly in the early seventies. This reduction was closely related to the sharp rise in export and domestic demands. When exports and domestic demand fell at the end of the seventies, excess capacity increased sharply, reaching a peak of $12.5 billion in 1986.

Over an intermediate period (1-3 years), commodity surpluses might decline (as during the seventies) in response to increased exports. However, the response of farmers to such a supply shortfall and to increased prices would be to increase planting and to increase the use of other inputs, which would sharply increase production. Therefore, the duration of the shortfalls and the decline of excess capacity would be relatively short and such periods would likely be followed by even more excess capacity, as during the fifties and the late seventies.

It is unlikely that domestic food use will increase rapidly. Thus, unless exports increase substantially or unless domestic demand for agricultural products outside the food sector increases (for example, as an input material for industry), excess capacity is unlikely to shrink. Production diversion programs like set-aside acres are only a shortrun solution to excess supply (surpluses) and do not change the basic problem of excess capacity.

Excess Capacity for Individual Crops

Tables 5 and 6 and figures 10-14 illustrate excess capacity for individual crops in the 1940-86 period.

Wheat

Longrun excess capacity in wheat production exceeded 20 percent in the late fifties, late sixties, and since 1982. Current longrun excess capacity is about 30 percent of potential production (fig. 10). Longrun excess capacity in wheat has been growing steadily since 1979. Excess production of wheat has exceeded the equivalent of 20 million acres since 1985.

Table 4--Sources of excess capacity, 1940-86 (million 1985 dollars)

Year	Domestic utilization		Total exports		Total utilization		Excess capacity	
	Million dollars	1940 = 100	Million dollars	1940 = 100	Million dollars	1940 = 100	Million dollars	1940 = 100
1940	30,900.2	100.00	843.0	100.00	31,843.2	100.00	1,371.4	100.00
1941	35,035.6	113.38	1,238.5	146.91	36,387.5	114.27	207.4	15.12
1942	36,506.5	118.14	1,213.3	143.92	37,838.0	118.83	245.5	17.90
1943	36,252.0	117.32	1,149.8	136.39	37,519.1	117.82	-988.2	-72.06
1944	34,247.2	110.83	1,627.5	193.06	35,985.5	113.01	1,504.5	109.71
1945	34,252.3	110.85	3,523.0	417.90	37,886.2	118.98	-1,091.2	-79.57
1946	37,227.8	120.48	4,819.9	571.73	42,168.1	132.42	-266.4	-19.42
1947	35,513.9	114.93	4,220.4	500.61	39,849.2	125.14	443.7	32.36
1948	28,049.4	90.77	5,091.5	603.95	33,231.7	104.36	3,738.2	272.59
1949	31,047.2	100.48	4,797.0	569.01	35,944.6	112.88	1,516.4	110.57
1950	35,728.4	115.63	5,314.8	630.44	41,158.9	129.25	-2,051.3	-149.58
1951	32,612.4	105.54	5,525.1	655.38	38,243.1	120.10	-1,239.4	-90.38
1952	32,492.5	105.15	4,098.8	486.19	36,696.4	115.24	3,573.0	260.54
1953	33,706.4	109.08	4,167.2	494.30	37,982.6	119.28	4,762.5	347.29
1954	33,991.3	110.00	4,553.7	540.15	38,655.0	121.39	3,583.5	261.31
1955	36,095.9	116.81	5,093.5	604.19	41,306.2	129.72	2,973.8	216.85
1956	35,363.1	114.44	8,541.3	1,013.16	44,018.8	138.24	2,751.4	200.63
1957	33,426.2	108.17	6,631.3	786.59	40,165.6	126.14	4,334.8	316.10
1958	33,083.8	107.07	5,576.8	661.51	38,767.7	121.75	6,812.7	496.79
1959	32,953.0	106.64	7,818.3	927.40	40,878.0	128.37	3,418.0	249.24
1960	33,607.8	108.76	8,383.5	994.44	42,100.1	132.21	4,413.4	321.83
1961	36,339.3	117.60	8,899.4	1,055.64	45,356.3	142.44	5,184.7	378.07
1962	35,364.6	114.45	8,292.6	983.66	43,771.7	137.46	6,990.9	509.78
1963	36,097.6	116.82	10,285.2	1,220.02	46,499.6	146.03	5,502.2	401.23
1964	36,881.3	119.36	8,966.5	1,063.59	45,967.1	144.35	6,013.7	438.52
1965	37,135.8	120.18	9,454.3	1,121.45	46,710.3	146.69	5,610.8	409.15
1966	37,483.1	121.30	9,324.9	1,106.11	46,929.3	147.38	4,673.3	340.78
1967	36,773.0	119.01	9,060.8	1,074.78	45,952.8	144.31	6,343.9	462.60
1968	36,719.0	118.83	7,013.9	831.97	43,851.7	137.71	7,592.5	553.65
1969	36,857.8	119.28	7,858.9	932.21	44,835.9	140.80	5,740.0	418.56

Continued--

Table 4--Sources of excess capacity, 1940-86 (million 1985 dollars)--Continued

Year	Domestic utilization		Total exports		Total utilization		Excess capacity	
	Million dollars	1940 = 100	Million dollars	1940 = 100	Million dollars	1940 = 100	Million dollars	1940 = 100
1970	40,878.4	132.29	9,412.3	1,116.48	50,423.0	158.35	3,106.0	226.49
1971	40,225.2	130.18	9,350.5	1,109.15	49,705.9	156.10	5,303.1	386.70
1972	45,034.1	145.74	15,391.7	1,825.74	60,571.5	190.22	4,630.4	337.65
1973	45,663.0	147.78	19,317.7	2,291.44	65,128.5	204.53	2,274.0	165.82
1974	43,179.5	139.74	16,763.7	1,988.49	60,082.9	188.68	1,240.2	90.44
1975	43,959.8	142.26	17,738.8	2,104.15	61,840.8	194.20	2,559.7	186.66
1976	44,726.2	144.74	17,296.7	2,051.71	62,167.7	195.23	2,444.7	178.27
1977	43,962.4	142.27	18,474.1	2,191.37	62,578.8	196.52	3,956.8	288.53
1978	45,602.2	147.58	19,553.6	2,319.42	65,303.4	205.08	2,342.8	170.84
1979	44,750.6	144.82	22,101.5	2,621.64	66,996.9	210.40	3,304.7	240.98
1980	48,183.6	155.93	23,331.0	2,767.49	71,670.6	225.07	-7.7	-.56
1981	43,141.8	139.62	20,556.3	2,438.35	63,837.7	200.48	7,760.6	565.91
1982	46,699.5	151.13	19,307.6	2,290.24	66,158.2	207.76	10,024.4	730.99
1983	50,345.3	162.93	21,130.7	2,506.49	71,638.9	224.97	1,527.2	111.36
1984	44,153.7	142.89	16,241.5	1,926.54	60,538.1	190.11	8,680.5	632.99
1985	48,395.7	156.62	13,356.5	1,584.33	61,908.8	194.42	18,130.3	1322.08
1986	45,662.1	147.77	13,240.1	1,570.52	59,050.0	185.44	10,235.1	746.35
Average	38,432.1	124.40	9,913.8	1,176.00	48,470.3	152.20	3,854.9	281.10

Figure 9: Longrun excess capacity
(7–year moving average)

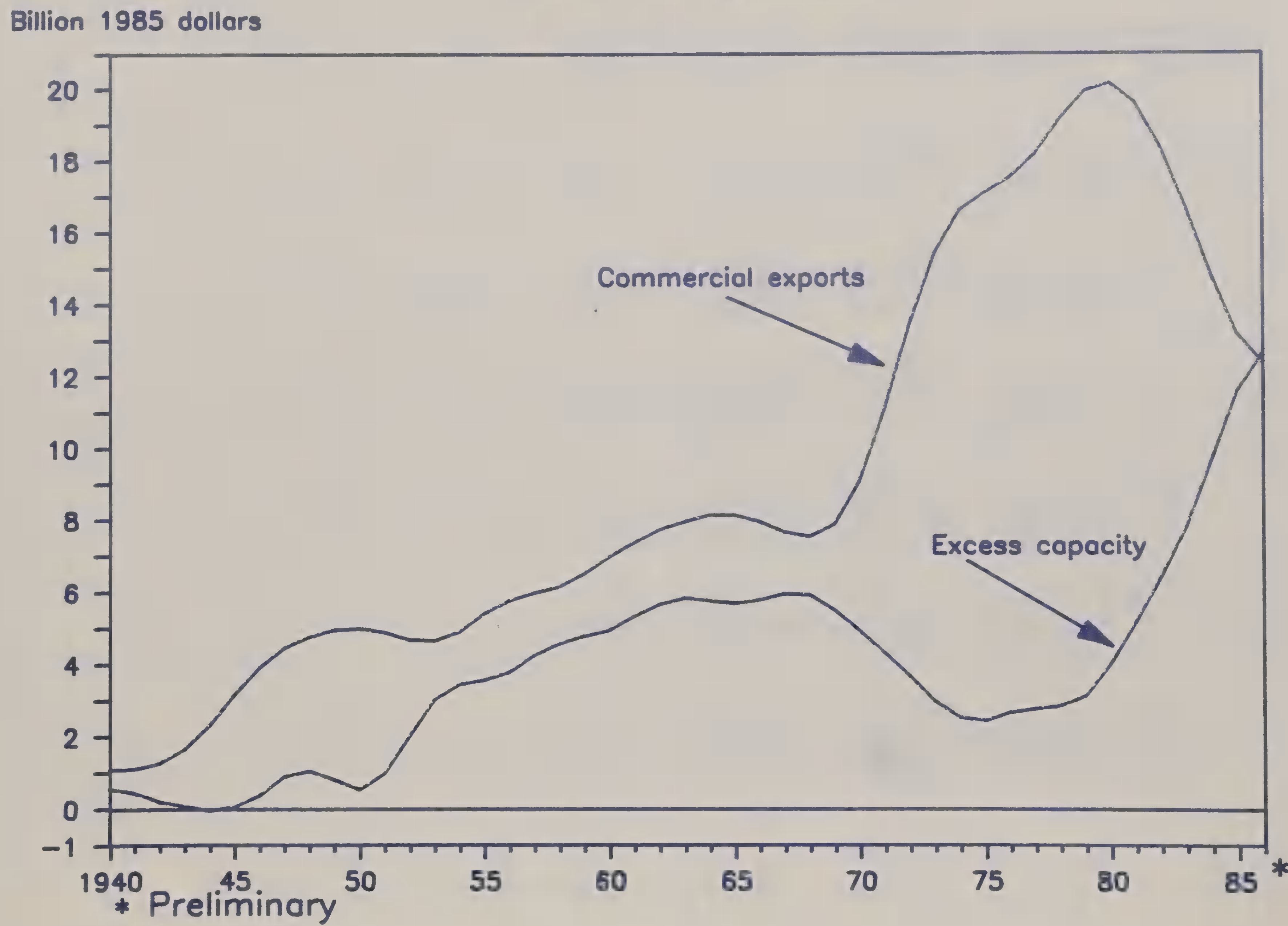


Table 5--Crop excess capacity

Year	Wheat	Rice	Corn	Oats	Barley	Sorghum	Feed grain[1]	Cotton	Soybeans	Tobacco	Peanuts	Dairy
	Bushels	100 pounds	Bushels					Bales	Bushels	Pounds		
						Million units						
1940	109.5	7.6	-33.8	75.1	10.3	0	17.9	1.8	0.6	289.5	53.4	397.0
1941	270.4	4.7	-144.5	-29.2	9.5	0	-153.0	-1.1	5.3	-130.0	-73.0	238.0
1942	23.9	8.9	-121.2	46.0	20.1	0	-77.7	.5	6.6	-146.2	119.6	2,537.0
1943	-234.0	8.7	-147.7	-51.0	-44.6	0	-215.0	.5	1.5	-217.2	61.7	8,032.0
1944	118.6	6.1	90.3	23.3	19.1	0	120.1	1.0	-1.4	98.9	-36.5	2,268.0
1945	-71.1	7.5	-134.3	56.1	-36.5	0	-133.6	-3.3	-5.7	118.6	60.1	5,871.0
1946	43.0	10.3	119.2	-16.5	-3.4	0	106.8	-4.5	1.0	373.2	-119.5	3,526.0
1947	125.2	11.2	-154.4	-92.0	-3.2	0	-210.0	1.0	-2.8	293.9	-63.1	442.0
1948	122.1	13.0	695.7	108.4	48.5	12.0	811.2	2.5	5.2	111.2	-47.4	1,245.0
1949	125.6	14.0	36.6	-82.8	-21.2	41.0	12.2	1.7	-4.2	43.1	-70.1	2,489.0
1950	-11.1	.8	-97.8	78.7	14.0	-21.6	-62.4	-4.6	2.2	55.6	146.9	1,126.0
1951	-126.7	-1.6	-247.1	-109.0	-20.2	-28.1	-354.8	.5	.5	260.6	76.3	-618.0
1952	365.3	-1.6	286.8	-28.2	-22.1	-2.5	249.2	2.9	8.3	202.1	5.9	339.0
1953	342.5	5.4	157.9	-22.4	19.6	14.8	176.7	4.3	-16.3	65.2	-148.5	10,200.0
1954	116.1	23.5	125.2	76.1	59.5	53.0	272.7	1.5	20.0	309.7	-132.7	8,588.0
1955	45.6	9.6	134.5	39.5	-8.0	10.2	160.5	3.5	-3.4	135.3	242.8	4,685.0
1956	28.6	-10.9	794.1	-97.5	36.2	21.0	790.4	-2.4	24.9	274.3	98.4	5,206.0
1957	281.8	7.7	590.5	119.8	63.2	271.1	984.2	-.5	36.6	-190.5	-109.5	5,870.0
1958	617.2	2.0	668.7	99.1	45.6	151.6	916.0	3.2	67.8	-92.1	154.1	4,658.0
1959	179.4	0	947.4	-1.6	-14.5	162.0	1,096.0	-.8	15.8	-131.2	-103.0	3,214.0
1960	326.8	3.4	730.8	196.2	22.0	241.0	1,102.8	.2	10.3	-84.4	-59.5	3,101.0
1961	195.7	1.5	607.6	86.0	1.2	214.1	871.9	1.5	94.5	10.8	14.1	8,019.0
1962	278.0	7.3	511.1	127.8	105.7	222.8	897.6	4.3	15.5	311.2	9.7	10,724.0
1963	95.5	5.1	931.5	160.8	76.4	196.7	1,285.6	2.3	29.8	298.2	8.8	1,745.0
1964	254.2	5.9	422.0	45.6	73.0	124.0	634.7	2.9	175.7	173.3	-48.3	7,676.0
1965	120.1	7.7	683.7	123.4	108.6	76.7	923.9	3.4	185.7	-145.0	-5.5	5,665.0
1966	246.1	4.8	990.1	7.7	112.6	155.8	1,246.9	-1.4	146.5	-159.4	-7.8	645.0
1967	289.9	6.3	1,181.8	63.3	36.1	266.2	1,515.2	-2.2	265.0	-25.2	55.5	7,427.0
1968	473.5	19.0	1,112.0	167.5	85.9	254.4	1,535.8	3.2	249.3	-239.1	86.4	5,150.0
1969	405.2	11.4	1,168.3	148.2	160.5	145.4	1,536.0	-.1	95.4	-119.0	79.2	4,480.0

See note at end of table.

Continued--

Table 5--Crop excess capacity--Continued

Year	Wheat	Rice	Corn	Oats	Barley	Sorghum	Feed grain[1]	Cotton	Soybeans	Tobacco	Peanuts	Dairy
	Bushels	100 pounds	Bushels					Bales	Bushels	Pounds		
	Million units											
1970	255.9	13.2	680.1	23.0	8.0	50.1	750.2	-1.2	-74.4	16.2	412.6	5,775.0
1971	553.5	3.4	1,162.9	29.9	33.5	183.4	1,392.1	.4	-29.1	-160.8	32.0	7,274.0
1972	121.4	6.0	829.2	-133.4	102.2	168.8	1,009.3	2.3	41.4	-190.3	125.6	5,347.0
1973	12.0	14.6	153.9	-154.0	-13.0	74.0	128.7	0	226.8	-322.9	217.3	2,185.0
1974	131.1	7.3	-60.8	-84.2	-52.2	-.4	-154.0	2.1	21.0	68.6	692.9	1,346.0
1975	286.3	38.4	102.3	-18.3	39.8	37.1	163.0	-2.0	63.0	252.3	16.8	2,036.0
1976	520.5	12.4	531.0	-39.9	.9	46.3	555.4	-.5	-127.6	229.4	-451.8	1,236.0
1977	177.2	-3.5	275.9	149.6	49.0	107.2	510.6	2.5	78.3	18.5	-26.9	6,080.0
1978	48.3	14.5	555.9	-32.7	81.9	12.7	620.0	-1.2	52.3	99.5	5.4	2,743.0
1979	268.1	6.0	548.7	-43.6	-16.0	26.0	536.2	-.7	222.8	-341.5	42.0	2,119.0
1980	202.0	8.3	-503.6	-58.8	-54.7	-34.8	-618.9	-.4	7.3	28.5	-215.0	8,800.0
1981	319.4	52.1	1,154.3	-25.5	10.7	191.0	1,340.0	4.0	2.8	302.7	344.0	12,681.0
1982	627.5	48.8	1,112.1	71.6	81.3	127.3	1,350.0	2.6	156.9	332.7	107.0	14,281.0
1983	818.3	36.5	-973.8	-29.9	6.9	36.5	-948.4	-1.0	-51.7	-71.1	-253.5	16,815.0
1984	774.7	53.6	867.6	3.6	85.4	79.6	1,022.5	3.3	191.2	264.3	813.7	8,637.0
1985	1,196.4	60.9	2,795.8	7.3	107.4	319.8	3,211.8	7.9	315.9	69.7	-578.6	12,589.0
1986	781.8	43.7	2,619.9	-50.2	90.8	263.3	2,932.3	-1.8	184.6	-260.7	-95.0	11,132.0
Average	260.7	13.1	505.5	19.9	32.2	90.8	635.3	.8	75.4	19.7	69.9	7,122.1

[1] Corn equivalent (56 pounds per bushel).

Table 6--Crop excess capacity

Year	Wheat	Rice	Corn	Oats	Barley	Sorghum	Feed grain[1]	Cotton	Soybeans	Tobacco	Peanuts	Dairy
						Percent						
1940	13.44	30.99	-1.38	6.02	3.30	0	0.29	14.04	0.72	19.82	3.02	0.37
1941	28.70	20.17	-5.45	-2.47	2.63	0	-4.23	-10.36	4.90	-10.30	-4.95	.21
1942	2.47	30.72	-3.95	3.43	4.68	0	-1.99	4.11	3.53	-10.38	5.45	2.17
1943	-27.73	29.58	-4.98	-4.47	-13.81	0	-5.37	4.76	.77	-15.44	2.83	6.97
1944	11.19	19.84	2.93	2.03	6.93	0	2.91	7.99	-.72	5.07	-1.76	1.97
1945	-6.42	24.56	-4.68	3.68	-13.68	0	-3.38	-36.99	-2.94	5.96	2.94	5.00
1946	3.73	31.69	3.70	-1.12	-1.30	0	2.48	-52.05	.47	16.12	-5.86	3.05
1947	9.21	31.73	-6.55	-7.82	-1.15	0	-6.25	8.67	-1.52	13.95	-2.89	.38
1948	9.43	33.98	19.30	7.47	15.37	9.12	16.80	16.51	2.28	5.62	-2.03	1.1[illegible]
1949	11.43	34.43	1.13	-6.79	-8.94	27.63	.29	10.59	-1.81	2.19	-3.76	2.[illegible]
1950	-1.09	1.93	-3.18	5.75	4.60	-9.25	-1.46	-45.58	.73	2.74	7.22	
1951	-12.82	-3.40	-8.45	-8.53	-7.86	-17.25	-8.72	3.17	.17	11.18	4.60	
1952	27.96	-3.25	8.71	-2.31	-9.70	-2.77	5.91	18.90	2.79	8.96	.44	
1953	29.19	10.25	4.92	-1.94	7.93	12.76	4.29	25.82	-6.06	3.17	-9.43	8.70
1954	11.80	36.64	4.09	5.40	15.69	22.50	5.99	11.30	5.86	13.80	-13.16	7.22
1955	4.87	17.14	4.18	2.64	-1.97	4.20	5.99	24.09	-.91	6.17	15.68	3.91
1956	2.66	-21.87	22.25	-8.43	9.57	9.96	16.92	-17.18	5.55	12.45	6.02	4.28
1957	24.99	17.89	16.68	9.09	14.08	45.17	18.35	-4.31	7.52	-11.01	-7.63	4.82
1958	39.54	4.45	17.01	6.80	9.34	23.87	15.81	23.07	11.58	-5.03	8.49	3.87
1959	15.48	.04	24.09	-.14	-3.27	25.16	19.30	-5.53	2.88	-7.30	-6.76	2.69
1960	22.84	6.29	18.02	15.19	4.74	32.95	18.32	1.59	1.79	-4.34	-3.46	2.57
1961	15.03	2.73	13.97	7.52	.28	29.46	14.11	10.20	13.50	.52	.85	6.50
1962	21.08	11.03	11.95	11.18	20.84	30.57	14.54	27.88	2.26	13.44	.56	8.65
1963	7.24	7.26	19.60	14.77	16.06	25.21	19.53	14.47	4.14	12.72	.45	1.42
1964	18.01	8.00	9.88	4.87	15.02	17.93	10.66	18.82	20.46	7.78	-2.30	6.15
1965	8.17	10.05	13.49	12.29	21.75	8.33	13.34	22.54	19.81	-7.82	-.23	4.64
1966	16.64	5.68	19.27	.89	23.02	15.72	17.82	-11.41	14.88	-8.23	-.32	.55
1967	18.77	7.09	20.84	7.40	9.12	28.84	20.20	-20.68	23.75	-1.26	2.15	6.36
1968	29.72	18.20	19.86	16.62	19.18	26.31	20.32	23.98	21.86	-13.78	3.27	4.46
1969	24.32	12.43	19.60	14.98	29.61	15.22	19.34	-1.33	8.44	-6.51	3.01	3.92

See note at end of table.

Continued--

Table 6--Crop excess capacity--Continued

Year	Wheat	Rice	Corn	Oats	Barley	Sorghum	Feed grain[1]	Cotton	Soybeans	Tobacco	Peanuts	Dairy
	Percent											
1970	15.51	15.69	13.20	2.51	1.57	5.72	11.04	-11.53	-6.60	.84	13.33	4.94
1971	29.15	3.96	18.35	3.41	7.19	18.49	16.90	3.08	-2.48	-9.34	1.03	6.13
1972	6.24	6.98	12.18	-19.31	19.01	16.40	11.78	15.03	3.26	-10.81	3.73	4.45
1973	.65	15.73	2.56	-23.37	-2.90	7.41	1.78	-0.02	14.65	-18.38	6.09	1.89
1974	7.34	6.48	-1.28	-14.01	-17.35	-.07	-2.57	17.78	1.72	3.42	18.39	1.16
1975	13.43	29.93	1.73	-2.87	10.42	4.80	2.24	-23.08	4.07	11.51	.43	1.76
1976	24.06	10.71	8.39	-7.38	.24	6.47	7.01	-5.17	-9.90	10.74	-12.08	1.03
1977	8.64	-3.51	4.23	19.87	11.41	13.67	6.19	17.47	4.43	.97	-.72	4.96
1978	2.47	10.92	7.34	-5.62	17.21	1.65	6.91	-11.22	2.80	4.84	.14	2.26
1979	11.65	4.52	6.79	-8.28	-3.98	3.09	5.62	-5.02	9.85	-22.36	1.06	1.72
1980	8.48	5.65	-7.59	-12.81	-15.14	-6.01	-7.97	-3.59	.41	1.60	-9.34	6.85
1981	11.47	28.49	14.22	-5.01	2.27	21.81	13.54	25.64	.14	14.67	8.64	9.55
1982	21.73	29.57	13.32	12.03	15.40	14.90	13.49	19.95	7.17	16.69	3.11	10.54
1983	26.15	24.32	-17.85	-6.15	1.28	5.92	-14.29	-8.60	-3.16	-4.98	-7.69	12.04
1984	25.59	32.92	11.02	.76	13.93	9.03	10.68	22.34	10.28	15.29	18.47	6.38
1985	42.02	34.90	30.43	1.39	17.59	27.84	28.74	49.82	15.06	4.61	-14.03	8.80
1986	31.14	24.12	28.85	-12.35	13.74	25.61	26.80	-14.99	9.20	-21.76	-2.57	7.73
Average	14.16	15.27	8.57	.78	6.04	11.87	8.30	3.72	4.84	1.23	.65	4.19

[1] Corn equivalent (56 pounds per bushel).

Figure 10: Wheat excess capacity

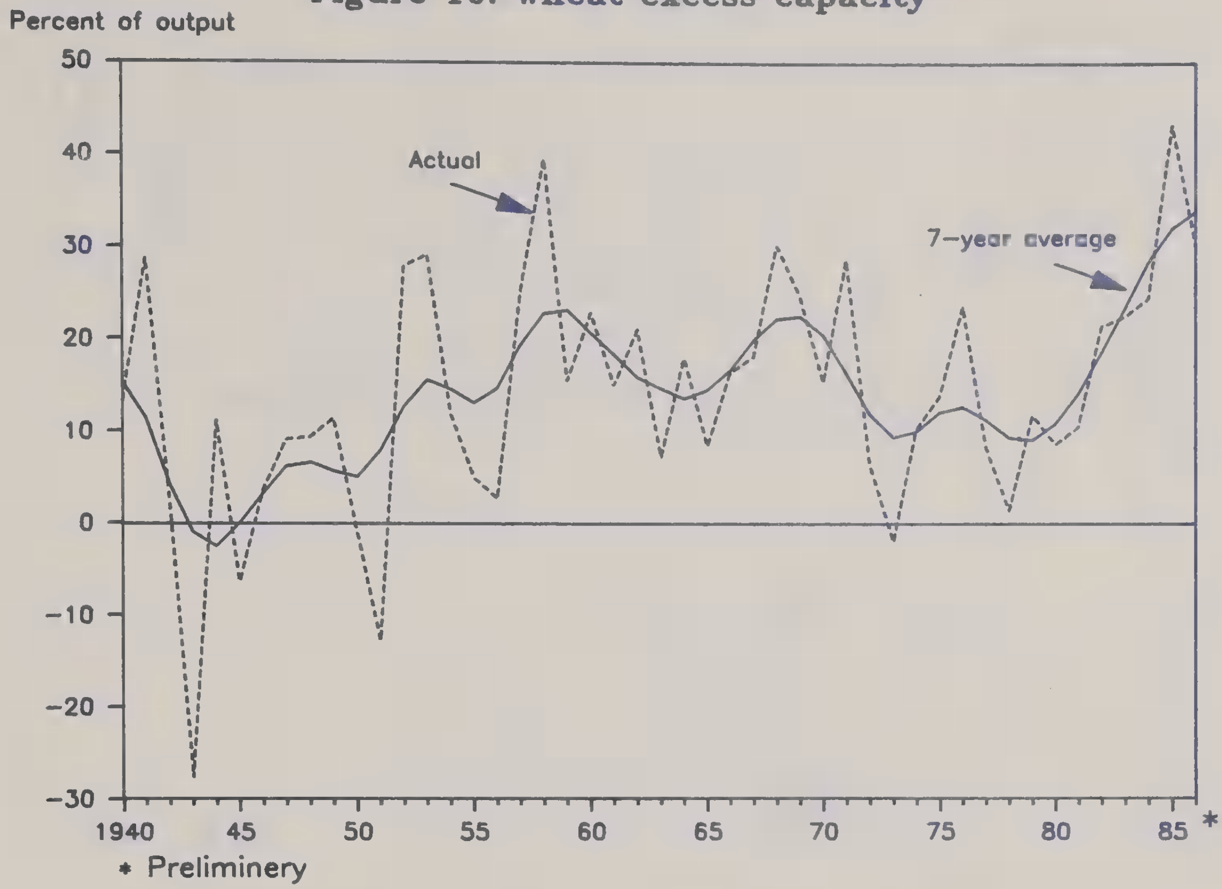


Figure 11: Feed grain excess capacity

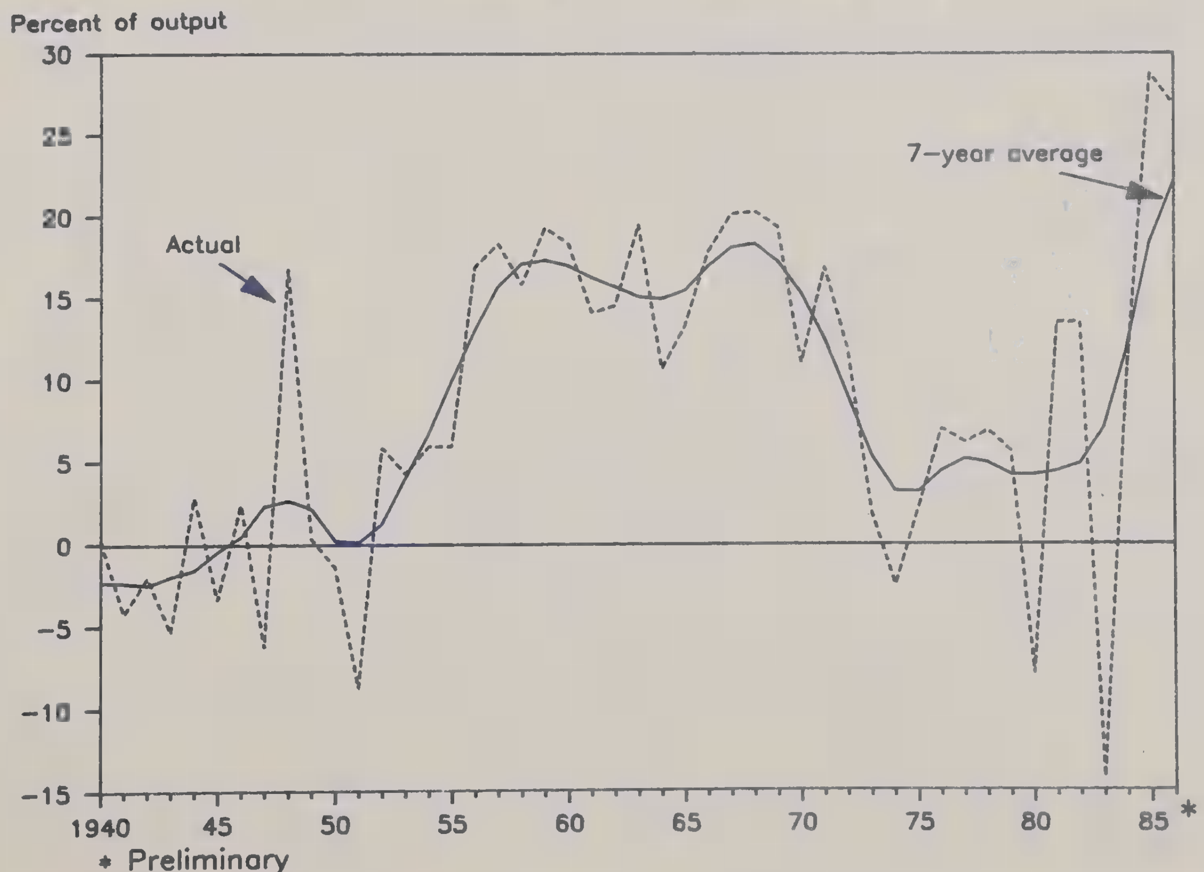


Figure 12: Cotton excess capacity

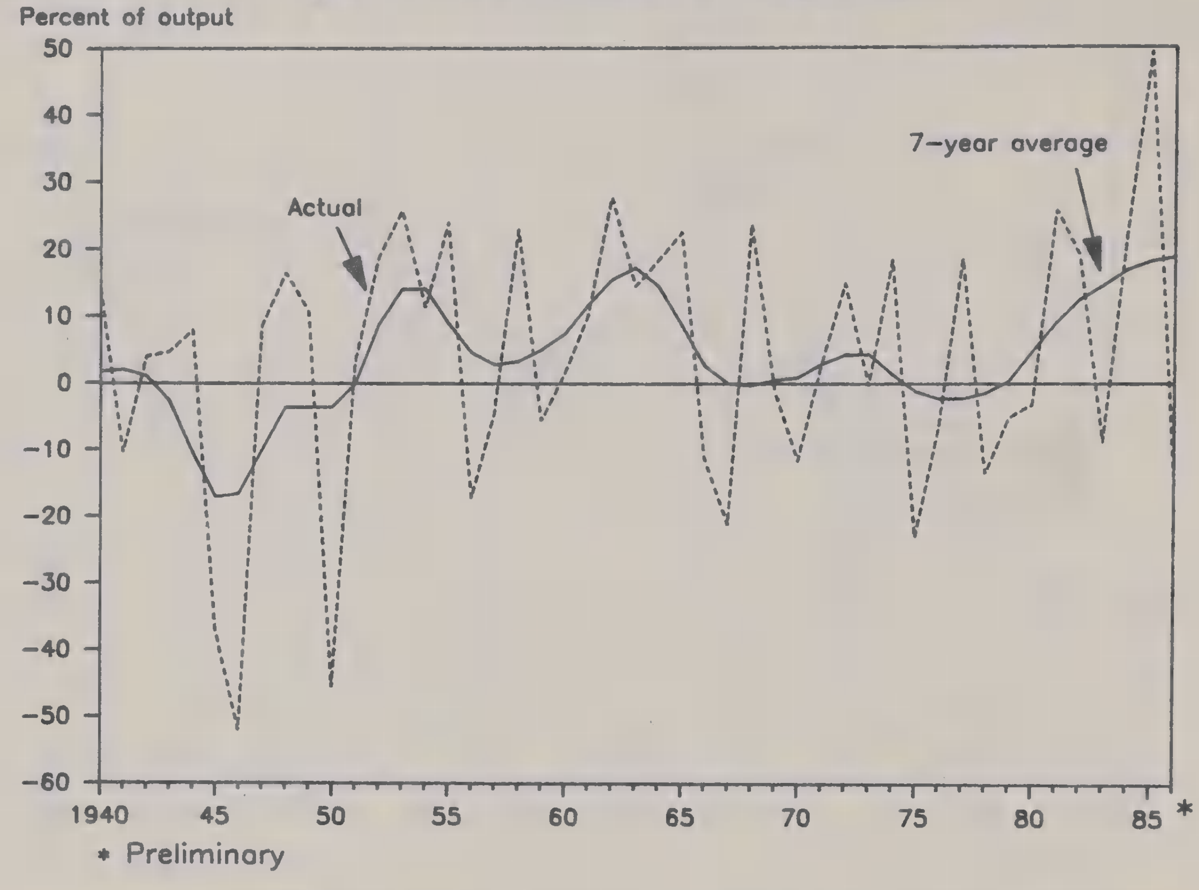


Figure 13: Dairy excess capacity

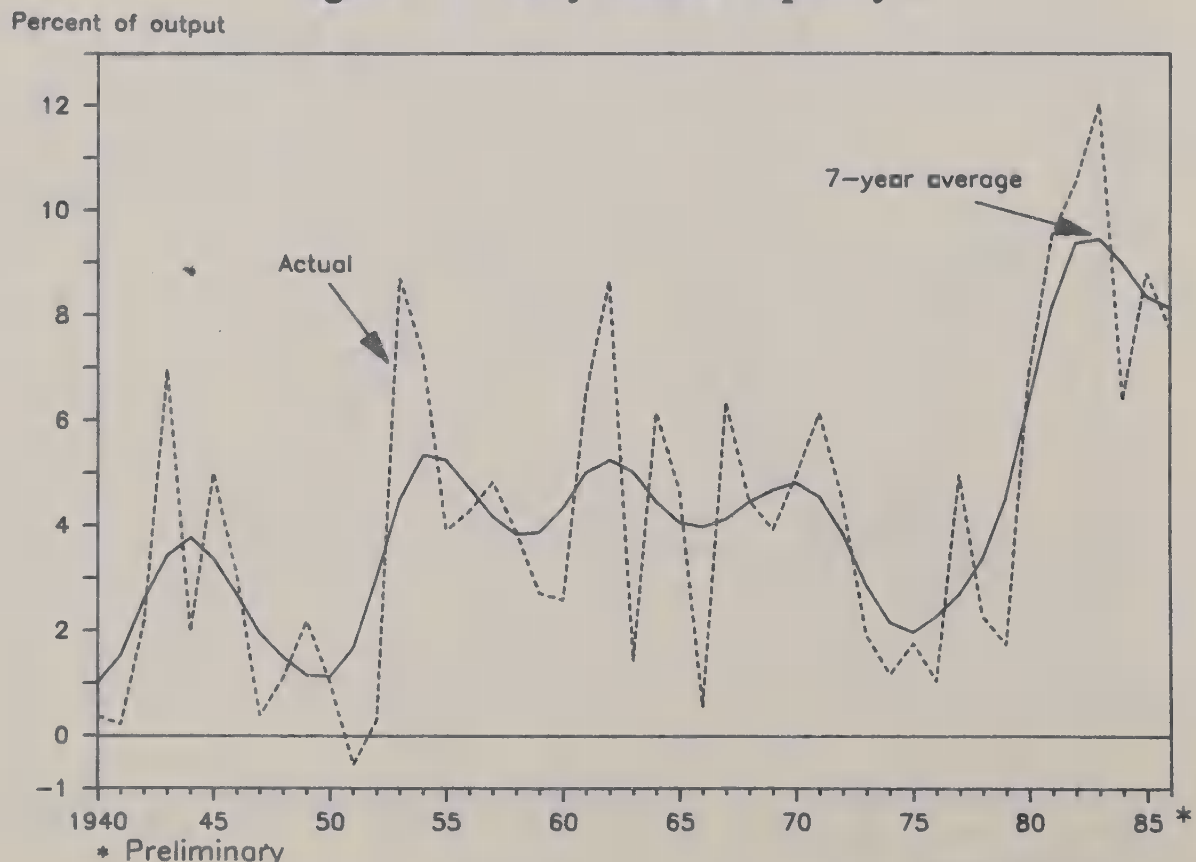
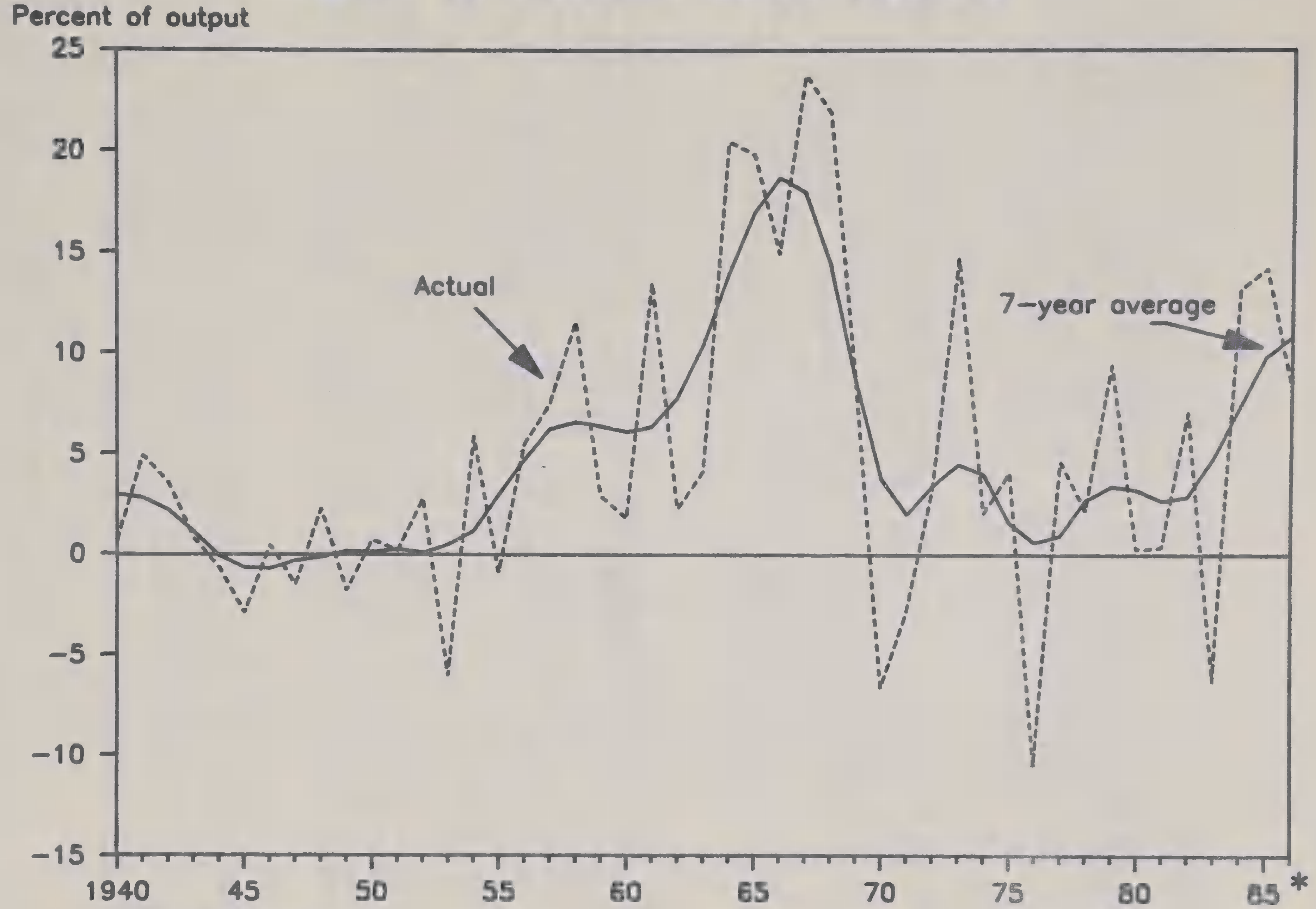


Figure 14: Soybean excess capacity



* Preliminary

Feed Grains

Longrun excess capacity in feed grains has increased steadily since 1979, reaching about 20 percent by 1986 (fig. 11). Excess production of feed grains was equivalent to 25 million acres by 1986. Current longrun excess capacity in feed grains is higher than its peak in the sixties. In the late fifties and sixties, longrun excess capacity varied between 15 to 18 percent.

Cotton

Longrun excess capacity in cotton has fluctuated widely over the years. This fluctuation is due mostly to changing yields and to great fluctuations in exports. Since 1976, longrun excess capacity in cotton increased steadily (fig. 12) in response to a sharp decline in exports. The sharp reduction of cotton prices since 1982 is clearly related to increased excess capacity. Longrun excess capacity peaked in 1985 at 19 percent. Excess production of cotton reached almost 8 million bales in 1985, but declined sharply in 1986.

Dairy

Longrun excess capacity in dairy fluctuated around 5 percent for a long time. The fact that excess capacity in dairy did not exceed the 5-percent level until recent years is probably due to marketing orders and to other programs that remove surpluses and control milk production. Between 1975 and 1982, longrun excess capacity rose (fig. 13). Within a few years, excess capacity in dairy more than tripled, from less than 3 percent in 1975 to more than 9 percent in 1982. The sharp increase in dairy excess capacity, almost all of which is excess supply, led to the initiation of the dairy buy-out program. Because exports of dairy products are a minor part of total production and because domestic consumption is unlikely to rise significantly, excess capacity and excess supply can be reduced only by a cut in production. Since 1983, excess capacity in dairy has declined in response to a decrease in total herd size.

Soybeans

Although soybeans are a relatively new crop, excess capacity is similar to that in other major crops (fig. 14). Longrun excess capacity in soybeans reached its peak in 1967 (18 percent). However, it dropped to only 2-3 percent in the seventies. Since 1983, soybean excess capacity has been increasing, reaching about 11 percent in 1986. This figure translates into about 7 million acres.

CONCLUSIONS

For a relatively short period in the seventies, it seemed as though U.S. agriculture had solved its excess capacity problem, but a sharp decline in exports led to a sharp rise in excess capacity. Except for the 1973-79 period, U.S. agriculture has faced a problem of excess capacity since the end of World War II.

The current percentage and value of excess capacity are greater than in the sixties or in any other period covered by this analysis. The 1986 preliminary value of longrun excess capacity ($12.5 billion) exceeds the previous peak of longrun excess capacity. This situation is related to greater agricultural production, increased use of agricultural resources, and decreased export demand.

Longrun excess capacity in agriculture was above 8 percent in 1985, compared with 2 percent in the early seventies. As already mentioned, this situation is closely related to the sharp decline in agricultural exports. Thus, an immediate reduction in excess capacity is likely to depend on an increase in the level of exports, especially for the seven major crops (wheat, corn, barley, oats, sorghum, cotton and soybeans) that are the source of most of the current excess capacity. Longrun excess capacity for these crops is more than 20 percent, compared with less than 5 percent in the early seventies.

Expressing longrun excess capacity in acreage equivalents indicates that, by 1985, excess capacity reached about 60 million acres or close to 20 percent of the total harvested acres. This is a significant increase from the early seventies when excess capacity averaged 12 million acres and 4 percent of the total cropland base. Expressing excess capacity in acreage equivalents does not imply that cropland is the only excess resource in agriculture. Placing a large number of acres under acreage diversion programs, as was done in the sixties and since 1980, does not reduce excess capacity; it does, however, reduce commodity surpluses. In contrast to the sixties when excess capacity was closely related to diverted production, excess capacity in recent years is associated with both excess supply and diverted acres.

In the long run, excess capacity is also affected by the increased use of other resources such as water, fertilizers, and capital. The increased use of these resources has been accompanied by increased yields from technological improvements, resulting in a much larger potential production from all agricultural resources.

Excess capacity in the long run is also related to productivity and resource use. All these elements are influenced by market prices, agricultural policies, and research and development activities of the private and public sectors. Thus, although agricultural policies are affected by the level of excess capacity, these policies are also an important factor influencing excess capacity.

Since the fifties, the actual and the potential levels of agricultural production have exceeded commercial utilization at prevailing prices. In addition to market forces, Government programs affect these prices both directly and indirectly. Government programs have also influenced the allocation of agricultural resources within the agricultural sector and between agriculture and other sectors in the economy.

We have seen in the past that programs such as set-aside and other land retirement programs do not reduce excess capacity because they do not move resources permanently from the agricultural sector. Such

programs can reduce only shortrun surpluses (excess supply), as they did very successfully in the sixties. In the shortrun, excess capacity might be reduced if exports were to increase substantially (at least to the level of the late seventies) or if domestic demand were to increase enough to absorb the excess capacity. But, large shortrun increases in agricultural exports have primarily resulted from bad weather, causing production shortfalls in importing countries. Furthermore, domestic demand for U.S. agricultural products is not likely to increase substantially in the short run.

Excess capacity in agriculture is caused primarily by agricultural prices that are higher than market equilibrium prices. Letting agricultural prices seek their free-market level would undoubtedly eliminate excess capacity, but this alternative might not be socially acceptable. If a substantial increase in export demand for U.S. agricultural products is unattainable and if the current level of excess capacity is not desired, then other solutions to the problem of excess capacity must be examined. Among the issues and the alternatives that would need to be examined are: the issue of a "desired" level of excess capacity, the implications of lower commodity prices, what kind of new industrial crops might use some of the unused capacity, the conversion of cropland into nonagricultural uses, the role of agricultural research and development, ways to increase consumption of food and fiber, and other alternatives.

REFERENCES

(1) Brandow, G.W. "American Agriculture's Capacity to Meet Future Demand," American Journal of Agricultural Economics, Vol. 56, No. 5, Dec. 1974.

(2) Chamberlin E. The Theory of Monopolistic Competition. 5th ed. Cambridge, MA: Harvard University Press, 1947.

(3) Cotner, M.L., M.D. Skold, and O. Krause. Farmland: Will There be Enough?. ERS-584. U.S. Dept. of Agr., Econ. Res. Serv., Jan. 1975.

(4) Ericksen, M.H. Use of Land Reserves to Control Agricultural Production. ERS-635. U.S. Dept. of Agr., Econ. Res. Serv., Sept., 1976.

(5) ------------, and K. Collins. "Effectiveness of Acreage Reduction Programs," Agricultural-Food Policy Review: Commodity Program Perspectives. ERS-530. U.S. Dept. of Agr., Econ. Res. Serv., July 1985.

(6) Heady, E.O., D.C. Faber, and S.L. Sonka. A World Food Analysis: Grain and Export Capacity of American Agriculture Under Various Production and Consumption Alternatives. Center for Agricultural and Rural Development (CARD) Report No. 60. Iowa State University-Ames, Sept. 1985.

(7) Heady, E.O., and L.V. Mayer. Food Needs in Agriculture in 1980. Vol. 1. Washington, DC: National Advisory Commission on Food and Fiber, 1976.

(8) Hertberg, M.P., A.I. Jacob, and J.E. Trevathan. "The Utilization of Manufacturing Capacity, 1965-73," Survey of Current Business, July 1974.

(9) Klein, L.R. "Some Theoretical Issues in the Measurement of Capacity," Econometrica, Vol. 28, No. 2, Apr. 1960.

(10) Quance, L., and L.G. Tweeten. "Excess Capacity and Adjustment Potential in U.S. Agriculture," Agricultural Economics Research, Vol. 24, No. 3, July 1972.

(11) Rector, Jerry. U.S. Department of Agriculture, Economic Research Service, Personal communication with author, Mar. 1987.

(12) Smith, A., and L. Quance. "Excess Capacity and Adjustment Potential in U.S. Agriculture. "U.S. Dept. of Agr., Econ. Stat. Coop. Serv., Natl. Econ. Div. Unpublished paper, July 1979.

(13) Spielmann, H. Capacity Measurement in the U.S. Agricultural and Nonagricultural Sectors: A Literature Review. Agricultural Economics Research, Vol. 29, No. 2, Apr. 1977.

(14) -----------, and E.E. Weeks. "Inventory and Critique of Estimates of U.S. Agricultural Capacity," American Journal of Agricultural Economics, Vol. 57, No. 5., Dec. 1975.

(15) Tweeten, L.G. "Diagnosing and Treating Farm Problems." Paper presented at the University of Arizona, Jan. 1984.

(16) ------------. "Excess Farm Supply: Permanent or Transitory?" in Farm Policy perspectives: Setting the Stage for 1985 Agricultural Legislation. Committee on Agriculture, Nutrition, and Forestry, U.S. Senate, 98th Congress, 2nd Session, Apr. 1984.

(17) Tyner, F.H., and L.G. Tweeten. "Excess Capacity in U.S. Agriculture," Agricultural Economics Research, Vol. 16, No. 1, Jan. 1964.

(18) Yeh, Chung J., L.G. Tweeten, and L. Quance. "U.S. Agricultural Production Capacity," American Journal of Agricultural Economics, Vol. 51, No. 1, Feb. 1977.

(19) Weisgerber, P. Productivity of Diverted Cropland. ERS-398. U.S. Dept. of Agr., Econ. Res. Serv., Apr. 1969.

APPENDIX: Regression Results

Changes in harvested acres and in set-aside acres, 1956-85

Crop	Regression coefficients 1/	Standard error	t-value	R^2	Comments
	Measure				
Wheat	-0.75	0.08	-8.96	0.74	Significant
Rye	-.28	.30	-.93	.06	Not significant
Rice	-.76	.14	-5.28	.50	Significant
Corn	-.61	.06	-9.60	.77	Significant
Oats	-.62	.40	-1.56	.08	Significant
Barley	-.02	.11	-.15	0	Not significant
Sorghum	-.58	.19	-2.99	.24	Significant
Cotton	-.63	.13	-5.06	.48	Significant
Soybeans	-2.04	1.11	-1.83	.21	
Tobacco	-1.23	.53	-2.33	.22	
Peanuts	-1.25	.52	-2.43	.24	
Total acres	-.66	.05	-12.58	.85	

Blanks indicate not applicable.
1/ Average effectiveness of set-aside programs.

a